

The AUTOMOBILE

Steering Gears Offer Many Problems

Actual Gear Superior to Layout—Lubrication the Great Trouble—Better Protection Desirable—Great Opportunity for Clever Detail Design

By A. Ludlow Clayden

STEERING gear as a matter of design has two sides, the mathematical and the mechanical. In *THE AUTOMOBILE* for Sept. 2, the former aspect of the subject was dealt with, it remains to review the other side and to study the detail of steering gears and connections. Steering is an automobile quality which is prone to deteriorate by the development of lost motion or slack between the hand wheel and the road wheel and this is due to two causes, the first being the number of bearings in the linkage, and the second the difficulty of properly lubricating those bearings.

Usually wear takes place first on the pin or yoke joints at either end of the tie rod, second on the universal joints of the drag link, third in the gear itself, and fourth in the axle swivels, though three and four may often be reversed in order. Wear in the actual steering gear is not so very troublesome, because there is frequently some means of taking up slack, also the opportunities for lubrication are ample so that undue wear in the gear generally means neglect on the part of the owner. All other parts, however, are difficult to deal with because the movement is so slight.

For the great majority of steering movements the wheel is not deflected more than a very few degrees back and forth, and this slight motion is of little value in distributing lubricant. Where grease is used, the lubricant is forced in by hand in screwing down the cup, and it then squeezes out of the loaded part slowly, staying out till such time as a fresh supply is injected. Oil would be able to find its way around the whole surface, but is apt in most cases to escape

altogether, leaving the joints even more dry than where grease is employed.

Greasing up two tie rod joints, two swivels, two drag link connections and one steering gear case is an operation taking time and much crawling about on the ground; while it is utterly impossible of accomplishment without donning overalls or ruining clothes. There used to be plenty of such dirty jobs on a chassis, but one by one they have been abolished, leaving only the steering gear practically in the same state as it was fifteen years ago.

The only way out of the difficulty that appears, is to make the joints self-lubricating so that they require attention at long intervals only. Also a great help would be to increase the size of the parts and so decrease the pressures. Yet another aid to durability, which is not exploited as much as it ought to be, is to use non-rusting metals wherever possible; to put in bronze bushings for the pins and to make joints which will be as nearly as possible waterproof. Leather boots or wrappings are a palliative only, however well made they may be, their life is fairly short and they are distinctly *not* engineering.

It is a wonderful thing, an amazing thing, that of all the automobile engineers in the world not twenty have produced cars that steer really well, and continue to do so month after month with little attention.

Taking the drag link connections first, these may be either ball joints or regular little universal joints. The former type is most used because it is cheaper and just as satisfac-

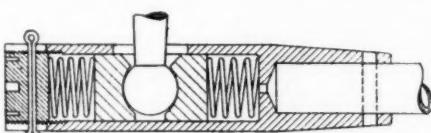


Fig. 1—Simple type of ball joint drag link connection for steering gear

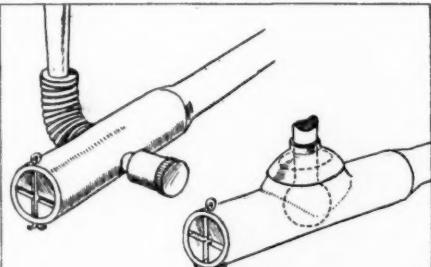


Fig. 2—Left—Suggested type of joint with a short piece of flexible metallic tubing for holding grease or oil
 Fig. 3—Right—Suggested type of self-protecting, oil-retaining universal joint

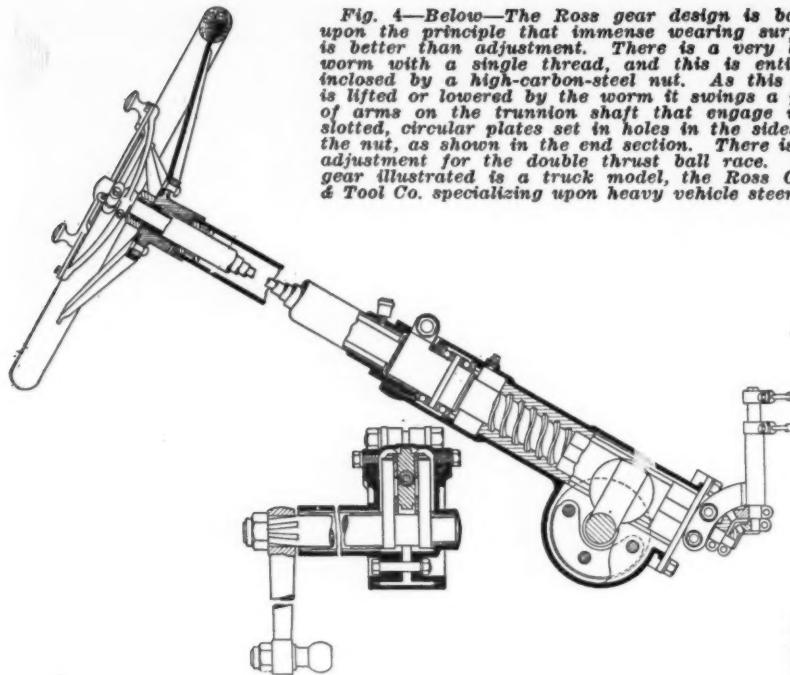


Fig. 4—Below—The Ross gear design is based upon the principle that immense wearing surface is better than adjustment. There is a very long worm with a single thread, and this is entirely inclosed by a high-carbon-steel nut. As this nut is lifted or lowered by the worm it swings a pair of arms on the trunnion shaft that engage with slotted, circular plates set in holes in the sides of the nut, as shown in the end section. There is an adjustment for the double thrust ball race. The gear illustrated is a truck model, the Ross Gear & Tool Co. specializing upon heavy vehicle steering

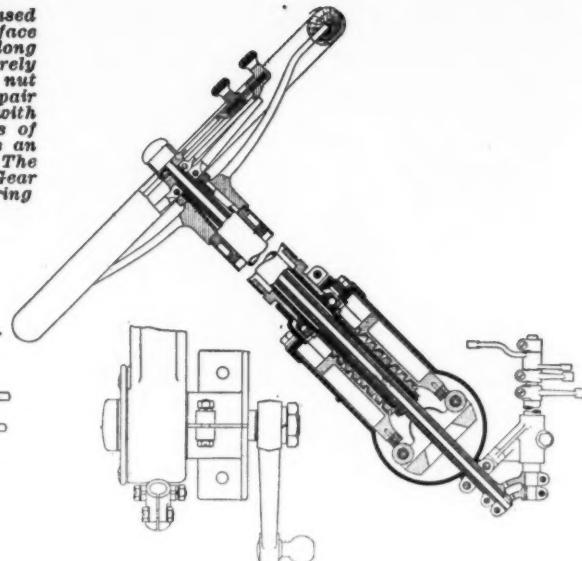


Fig. 5—Above—The Jacox steering gear has a substantial steel worm inclosed by a semi-steel nut, which is split lengthways into halves. The worm is double threaded, both right and left hand, so that turning the wheel causes one half nut to rise while the other falls. The ends of the nuts bear upon a rocking yoke which is connected to the external steering arm. One of the greatest virtues of this design is that a single adjustment of the nut that backs the ball thrust race takes up all wear. Owing to the very large thread surface wear is very slow. The maker is the Jackson-Church-Wilcox Co.

tory as the latter if made properly. There have been a good many accidents due to ball joints dropping off, and many ways for preventing this have been devised. One of the simplest is shown in Fig. 1. This is not any particular joint, but is the basic principle of several. The main idea is that the cups which press against the ball are backed by strong springs that take up the wear automatically, and if one spring breaks the other drives the whole assembly along till the neck of the ball is caught by the edge of the hole in the outer case. The only drawback to this style of joint is the difficulty of renewing lubricant, for to get grease actually between the ball and the cup it will not suffice to plaster the outside. To make certain of it the joint needs to be taken apart and greased in that condition. Mud, and washing water from a hose also tend to remove the lubricant rapidly.

It is not easy to see how this type of joint could be entirely inclosed, but Figs. 2 and 3 show a couple of rather clumsy suggestions. The former uses a short piece of flexible metallic tube which would hold a soft grade of grease and possibly a heavy oil. The latter adapts the idea of the self-protecting universal joint and would be oil retaining. These devices should greatly outlast leather wrappings which are never completely waterproof and cannot hold oil.

Some Special Joints

A rather ingenious joint used by a few automobile makers is shown in Fig. 6; this is non-adjustable but it is to a great degree self-protecting. The grease being fed to the interior of the ball insures it reaching the working surface, and in exuding it drives all dirt before it. Such joints will wear for years if the greaser is given a turn every day, but their life depends upon this attention.

On the Peugeot racing cars there are no ball joints, the little universal shown in Fig. 9 being used instead. With this type grease can be supplied through hollow bolts as for a spring shackle bolt, and frequent attention to the grease cups will prevent wear. The universal type of

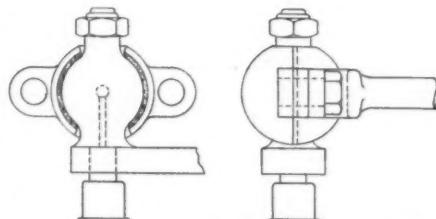


Fig. 6—A non-adjustable joint which is, however, to a great degree self-protecting

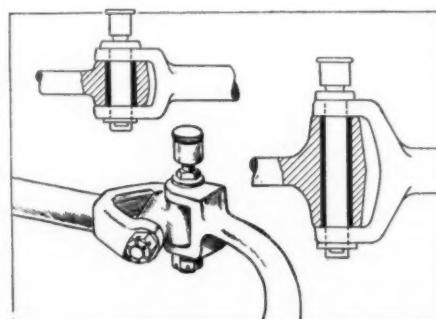


Fig. 7—Above—Original type of tie rod yoke. Fig. 8—Right—Illustrating how durability of this type has been increased by widening the jaws. Fig. 9—Small universal used instead of ball joints on Peugeot racing cars

connection is less easy to inclose, however, and when exposed is just as great a sufferer from neglect as the ball joint, which is simpler and cheaper.

Tie Rod Joints Get Longer

The original tie rod yoke was something like Fig. 7, and the durability of this bearing has been increased greatly by widening the jaws so as to give more surface to the pin as in Fig. 8. Wear on these joints is particularly annoying because it not only gives slack to the steering wheel, but it is liable to set up a continuous rattle of most irritating character. Here again lubrication is rendered difficult by reason of the extremely small angular movement and the only solution of the difficulty is frequent application of fresh oil or grease. The self-lubricating bushing of compressed graphite ought to find an application here and there is no reason save cost why the pins should not be bronze instead of steel.

Some manufacturers of expensive cars have used ball joints for the tie rod instead of ordinary yoke ends and where there are self-adjusting springs this prevents rattle. Probably the greater difficulty of protecting and lubricating the ball joint offsets the main advantage, however.

Schemes for Swivel Lubrication

There are two types of front axle, the most popular in America being that sketched in Fig. 13, and the one most used in Europe in Fig. 14. The difference is that in the American pattern the thrust bearing is located at the upper end of the swivel pin, while in the other variety it is at the bottom. Taking the most used type, the tendency is for the pin to wear at the ends, and for the

thrust washer to wear. From the viewpoint of freedom in steering it is an advantage to use a ball thrust bearing, but there are two drawbacks, first water, if it enters as it practically must do sooner or later, will destroy the balls and races immediately; second, the movement is normally so slight that the balls tend to make pits in the races due to repeated shocks. Thus the plain thrust is better if only it can be lubricated. Obviously, a plain thrust bearing with an area of 2 sq. in. or so and with a load of 1000 lb. on it is not easy to grease, and the grooves cut in the face of the washers do not help much as there is so little movement to distribute the grease.

It has often been an ideal with designers so to arrange the thrust bearing that it is permanently in a bath of lubricant. In Fig. 15 the Sunbeam design is shown and it may be noticed that the big brass cap at the top entirely protects the ball thrust washer from water, which could not reach it by any possibility. Also it is only necessary to remove the cap and fill it with grease about as frequently as it is necessary to do the same by hub caps, if indeed as often. This example is chosen as being one of the first attempts, but the same idea appears in various forms in a good many modern designs. Excellent steering swivels have been made with all ball bearings, both of journal type and cup and cone type. Also swivels have been made with taper roller bearings, but

the plain bearing for the pin, combined with a properly lubricated thrust, also plain, gives just as good an effect as the expensive combinations.

Probably the reason that the detail of steering gear has had so little attention is that the cheapest forms will operate fairly well if they get a complete overhaul every 10,000 miles or so. For a really cheap car this is good enough, but the buyer of an expensive machine is quite capable of appreciating a design which would reduce the trouble of greasing and enable the steering to be maintained in its original state of efficiency for the life of the car without rebushing joints. For the manufacturer who wants a novel talking point that of safe, easy and durable steering offers a hitherto neglected opportunity.

Steering Gears of Many Patterns

For the passenger car an absolutely irreversible steering mechanism is not desirable, for it destroys the "feel" which is essential to quick steering and is obtained by a gear that is just a little short of being quite irreversible. It is necessary to strike the happy mean.

In the main, steering gears divide into two types, those with a short worm and worm wheel, or part of a wheel, and those with a screw and nut. The former is the simpler, but it is less easy to adjust for wear and it does not give so large a wearing surface. In early attempts with the screw and

Fig. 10—Center—The Lavine gear uses much the same principle as the Jacox, the difference being mainly in detail. That is to say there is a divided nut operating on right and left hand threads cut in a single worm, operating the steering arm through a rocking arrangement. The particular feature of this gear is that every wearing part is made from heat treated alloy steel. The double thrust bearing is located at the bottom of the gear case, and the adjustment consists of a single, simple setting for the thrust bearing. The adjusting nut is situated at the bottom of the casing, just above the lower ends of the control levers. Wooden distance pieces are employed to keep the control tubes apart and to prevent rattle. The splined end on the trunnion shaft allows the steering arm to be set in the position desired by the chassis maker. This gear is made by the Lavine Gear Co.

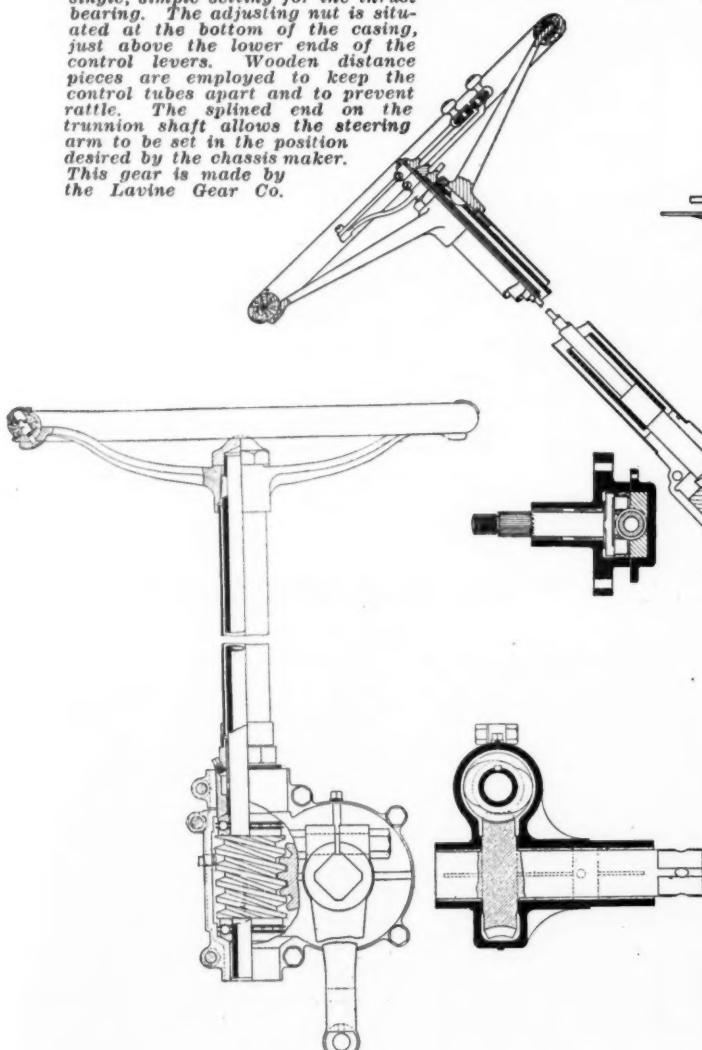
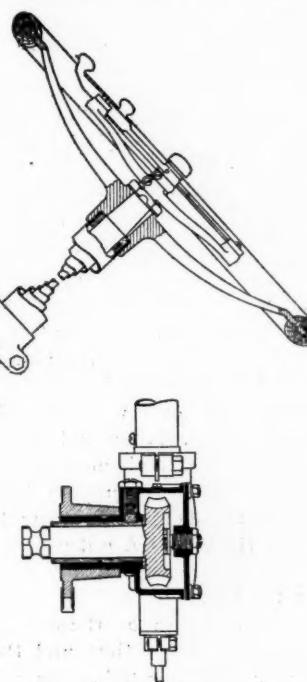
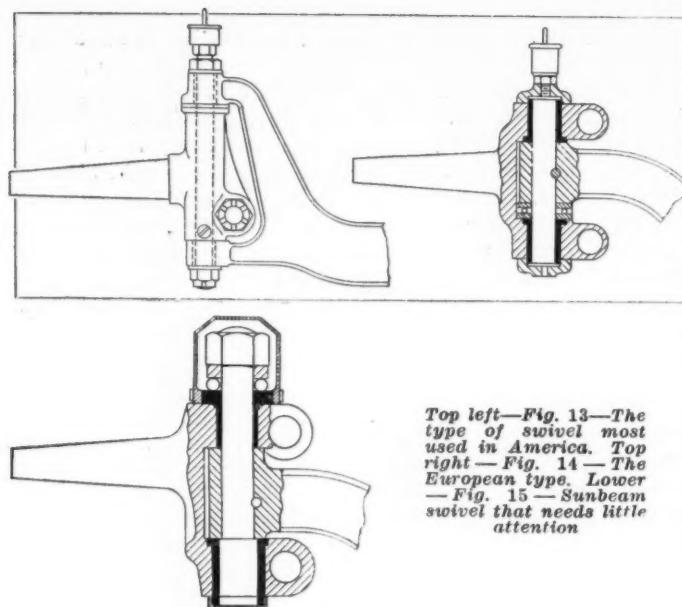


Fig. 11—Above—The Warner gear is one of the most widely used and is representative of modern worm and wheel practice. There is an adjustment for the thrust bearing behind the worm and an eccentric bushing allows the worm wheel to be brought into closer mesh as wear may create small backlash. It may be noticed that the trunnion shaft has one long bearing with a readily accessible adjusting screw. The Warner gears are somewhat lighter this season by reason of a more compact design which reduces the overall size while maintaining the wearing surfaces. They are made by the Warner Gear Co.

Fig. 12—Left—The Barnes gear is a worm and wheel pattern having two adjustments, one back of the thrust bearing and the other on the trunnion shaft bearings, the shaft being held in eccentric bushings. The use of a full worm wheel and a square end shaft allows the four quarters of the worm wheel to be used in turn, thus providing yet another increase of durability. This gear is made by the Barnes Gear Co.





Top left—Fig. 13—The type of swivel most used in America. Top right—Fig. 14—The European type. Lower—Fig. 15—Sunbeam swivel that needs little attention

nut type the advantage of big contact on the thread was often lost by the use of some sort of rocking joint which had a very small surface, but this has been corrected, and to-day there are plenty of nut gears possessing remarkable durability.

Simplicity favors the worm and wheel type, and if this is well made with a good size of thread its durability is excellent. Practically the only adjustment possible is to mount the worm wheel on eccentric bushings, so that it can be brought into closer contact with the worm as it wears, but this adjustment is imperfect, because wear is never even, since it nearly all occurs at the center position corresponding to a few degrees of steering movement only. The idea of using a complete worm wheel instead of a segment is that when one quarter of it has worn, the wheel can be removed from its shaft, given a quarter turn, and replaced with a fresh, unused surface to the worm. If the worm is the harder member of the gear this practically quadruples the life of the gear. A nut gear can be adjusted in several ways, and needs an adjustment for the rocker bearing as well as for the nut.

In the design of these gears there has been only detail change for some time and they are mostly of a quality of service that precludes the probability of alteration. Here and there weight has been reduced by simplification of design and by the use of materials with a greater strength.

In general, the aim of the maker of the gear is to provide

the largest bearing surfaces possible with reasonable weight and size so that adjustment shall be necessary only at very long intervals. There are, of course, very many different patterns of steering gears, but in selecting the few which are illustrated in section it has been attempted to cover the main principles in common use.

Adjustable Rake

A feature of steering gear construction which is obtaining greater attention is the inclusion of some device whereby the rake of the column or post can be altered. Ability to so set the angle is very useful to the automobile manufacturer who usually is well cared for by the steering gear specialist. It is to be regretted that the automobile maker so rarely constructs the body and the clamping arrangements for the gear that the user is able to swing the gear an inch or two forward or back to suit his stature.

In mounting the different parts of the gear, ball bearings are almost always employed for taking the thrust of the worm or screw, except in gears which are subjected to very violent shocks, as are heavy truck steerings. For journal bearings there is a marked trend toward the ingenious self-lubricating bronze bushings with graphite inserts. With such equipment only an extremely small quantity of oil has to be inserted to keep the worm thread in good condition; the bearings look after themselves.

Another point which has caused trouble in the past, but has now been overcome is that of rattle between the several tubes inside the post, which connect with the control levers above the steering wheel. Where there are three or four drawn steel tubes of this section one inside the other, vibration can readily set up a chatter that is particularly irritating. All gear makers almost have settled upon one way to prevent this chatter, that of giving the tubes bearings on each other at sufficiently short spacing. Sometimes this is done by knurling the tubes or raising collars on them, sometimes by the insertion of bronze bushings and sometimes by wooden spacers. All seem equally effective in service.

Materials Are Factors

Materials used in construction do not vary very much, the important wearing parts such as the worm and guides or rocker pinions being a high quality steel. For the outer case malleable cast iron is most popular, and the tubing is commonly cold drawn steel. Choosing steel for steering parts is a somewhat delicate operation, because surface hardness to give durability is needed combined with great toughness to resist the continual shocks to which a gear is subject, hence steels of the nickel chrome variety and alloy steels deriving their qualities from careful heat treatment are used frequently.

Packard Uses Special Vehicle for Moving Machinery



Building operations at the plant of the Packard Motor Car Co., Detroit, Mich., are going forward at such a rapid rate that it has been found necessary to construct a special vehicle for the transportation of machinery between the old and new factory units. As shown in the accompanying illustration, where a special crankcase milling machine weighing over 21 tons is being moved by a Packard 4-ton truck, the special vehicle is constructed of extra large motor truck wheels, mounted on special axles and carrying a platform made of 12-in. channel steel frame and special oak flooring. At the forward end of this float is anchored a winch by which the machinery is loaded onto its truck

Gearsets Are Smaller and Lighter

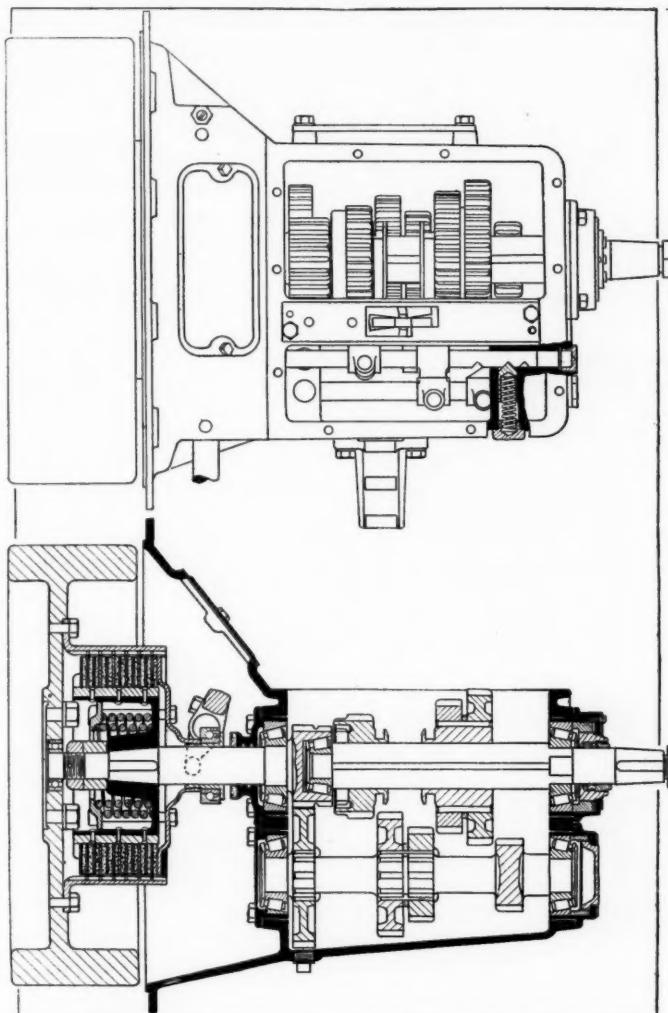
Roller Bearings Increasing in Favor—Popularity of Iron Case Due to Noise Problem—Ease of Gearshifting Obtained by Clutch Design

As with steering gears, so with gearsets, change has been slow and development by easy stages. There has been only one great change in automobile gearboxes since they first were used, this being the introduction of the direct drive, which came more or less simultaneously with the live axle transmission. From this point onward development has been directed toward simplification of detail, elimination of noise and reduction of size and weight.

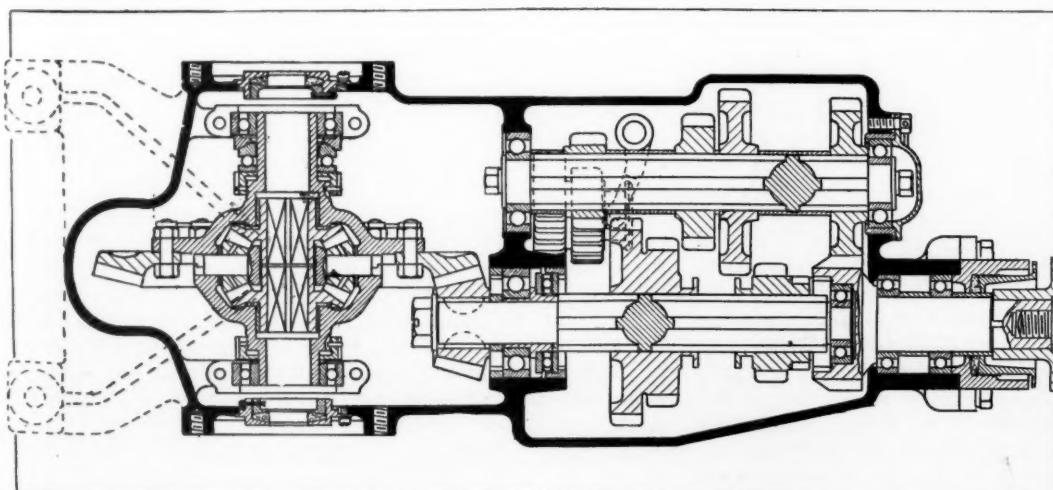
Lately the main development has been the great simplification rendered possible by the coming of center control, and changes in the form of bearings most popular with manufacturers can also be observed. Steady abandonment of the rear axle situation for the gearset and the growth in favor of the unit power plant has made noise in the gearing far more difficult to eliminate, or rather, more noise is permissible in the old type than can be allowed for the new. Of course, in these days of everywhere on high, the noise made by second speed and low gears is of little importance, that which counts is the hum of the constant mesh pinions. It is the opinion of several prominent engineers that the most potent influence in reducing this sound is continuity of engine torque, eights and twelves proving easier to cope with than sixes or fours, but apart from this the bearings used seem to have the greatest influence. That the quietest gearset is obtained by the use of all plain bearings seems to be agreed by everyone, but the difficulty of satisfactory lubrication is such that ball or roller bearings are used almost always for both portions of the main shaft.

For the countershaft plain bearings are used fairly often, because the latter can be so situated that it is in a permanent bath of oil or grease. Roller bearings especially certain types, seem to give quietness results nearly as good as plain bushings, so it is not surprising to find that their use is increasing. Of all bearings the most difficult to quieten is the ball bearing, which is regrettable, because it is the easiest to apply in limited space and its frictional efficiency is, of course, very high.

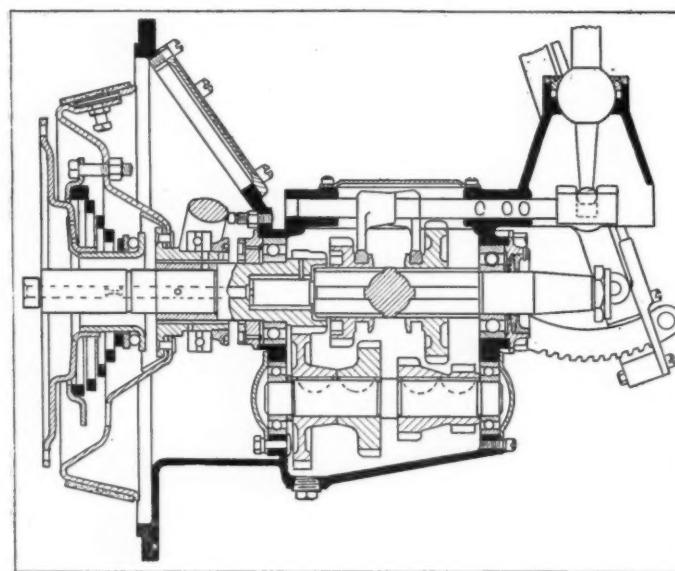
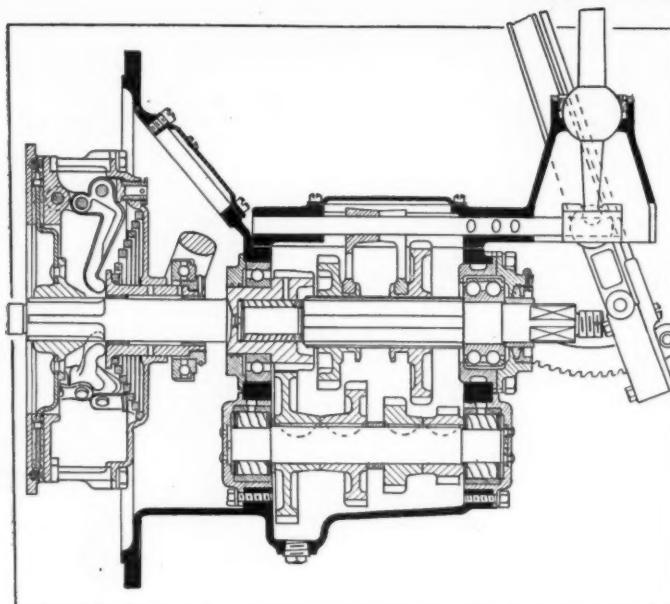
The average gearset, judged from the specifications of a



Above—Brown-Lipe four-speed gearset with several characteristic features. Special attention should be given to the mounting of the taper roller bearings and the use of one of these for the spigot. The box is small for a four speed type



Left—A Warner gearset for 3-ton trucks having chain drive. This illustrates a way of using ball bearings exclusively. Nickel-chrome steel is used for the gears to allow of sufficient strength with small dimensions

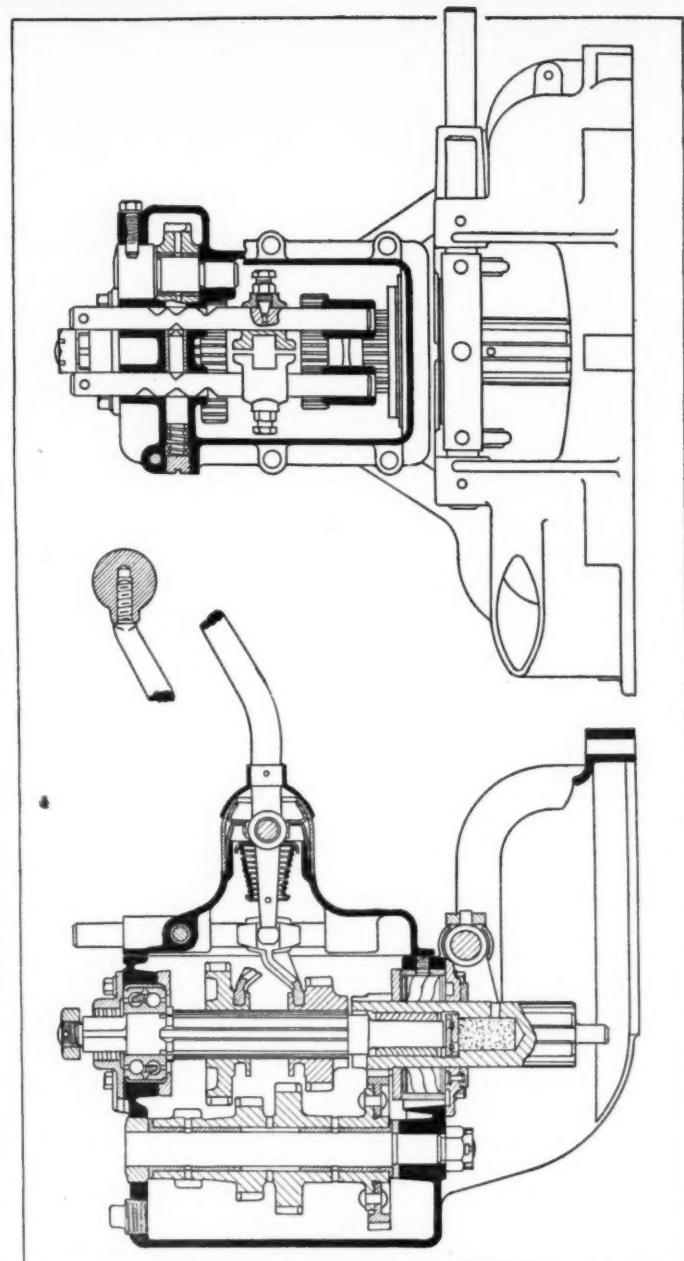


These two Warner gearsets illustrate above a moderately heavy gear and below a lighter type. The former has a large ball thrust bearing and the roller spigot that is becoming very widely used. It will be noticed that both gearsets have shafts with four splines and that the countershaft gears are separate pieces pressed on the shaft. Two types of clutch are shown and it is a Warner feature that these are interchangeable without any alteration to gearset or flywheel where the size of the gearset is the same. Both the clutches illustrated have very light inner parts.

large number of standard types, has ball bearings for the main shaft and roller bearings for the countershaft. Often ball bearings are used for only the front end of the main shaft, but in many cases a ball race is used at the tail end because of its ability to resist the occasional end thrust from the drive shaft.

A conspicuous bearing development is the steady increase in the number of gearsets with a ball or roller spigot bearing. This spigot has always been the weakest point in the direct drive type of transmission, because the bushing is so located that its lubrication is a trifle uncertain, and it runs at quite high speed when the low gear is in use. The load on it may also be considerable, and if it wears and so gets slack the shafts are put out of line and noise results immediately. At present the most popular bearing for the spigot is a small, special type of roller, and this has proved wonderfully satisfactory in service. A ball bearing is used in a good many gearsets but is not so easy to accommodate as the roller.

In passing, the comment may be made that it is rather re-



The Northway gearset uses a stationary countershaft, the gears thereon being bushed. The front end of the main shaft relies largely upon the steady bearing in the flywheel and on the very long roller spigot. Thrust is cared for by the ball bearing at the tail end. In the plan view the interlocking device is shown. The spring support for the shift lever inclosure is a feature

markable the general adoption of the unit power plant has not led to the use of plain bearings throughout the gearset, with pressure lubrication from the same oil pump as supplies the engine. It would be easily possible to work out a design which would be both cheap and efficient and the need for quietness would be served in the best possible way. However, to arrange this would need a correspondence in design between motor and transmission and would hardly be applicable in a general way.

Rather curiously, many experiments with helical gears for the constant mesh pair have not led to the general use of this type of tooth; it seems no easier to insure quietness with it than with plain spur teeth. If this really is true, then it seems unnecessary to use helical teeth for the timing gears in the motor. The two cases are contradictory and the situation not easy to understand, for cost hardly enters into the matter.

An undoubtedly important factor is the rigidity of the support given to the short, front portion of the main shaft

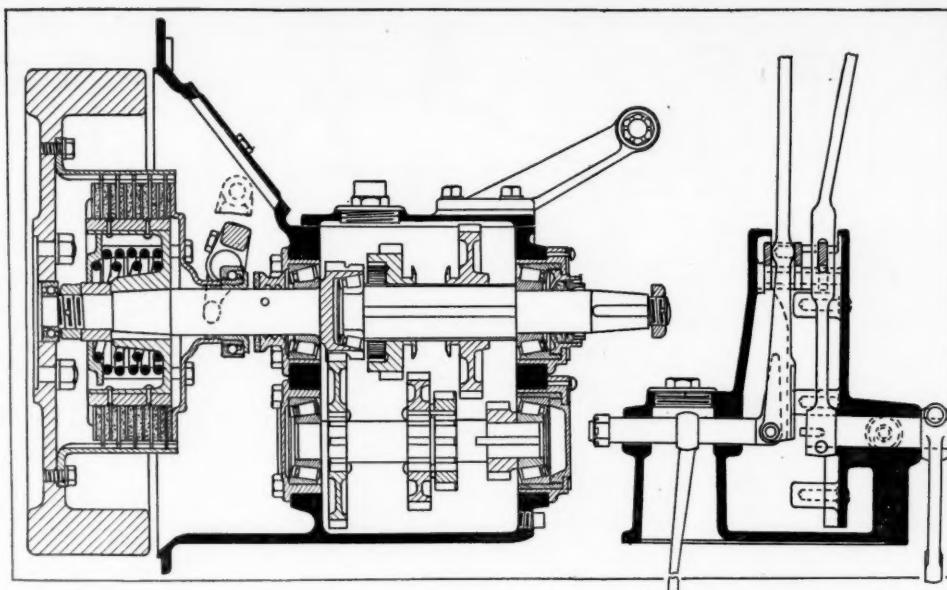
which, in many unit powerplant designs often becomes almost an integral portion of the crankshaft when the clutch is engaged. Study of the illustrations shows how different manufacturers have tackled the problem.

Another factor in noise production is the material of which the case is made. Iron it is found, makes a quieter casing than aluminum, which at first seems curious, as iron is certainly a far more resonant metal. Probably the explanation is to be found, at least partly, in the greater rigidity of iron. While it is easier to get a quiet transmission with iron inclosure, it is quite possible to get as good results with aluminum by a careful study of the sections, and, perhaps the addition of a web or rib here and there. Just at present the price of aluminum encourages the use of iron, but it is unlikely that this will continue as the price returns to normal.

Most important of all, from the noise viewpoint, is the original cause of the noise, the gear itself, and it is noteworthy that manufacturers are steadily year by year, making better gears and mounting them more accurately. The allowable tolerance on the accuracy of alignment between the shafts has been made smaller, the methods for heat treating and hardening the gears have been improved, the machines for cutting the teeth are doing more accurate work. One of the leading gearset makers actually uses a burnishing process after the gears are otherwise finished, so as to remove the least roughness from the tooth faces.

Four Speeds Not Wanted

For passenger cars the four-speed gearset has almost ceased to exist, but it is still obtainable from most manufacturers, and it is stated that there appears to be a tendency toward its use for light trucks. With modern engines and the low rear axle ratios of to-day there is little need for



The three speed Brown-Lipe gearset is very like the four speed pattern, having the same taper roller bearings. It will be seen that the sliding shaft is of square section. The use of a double clutch spring is characteristic of Brown-Lipe practice

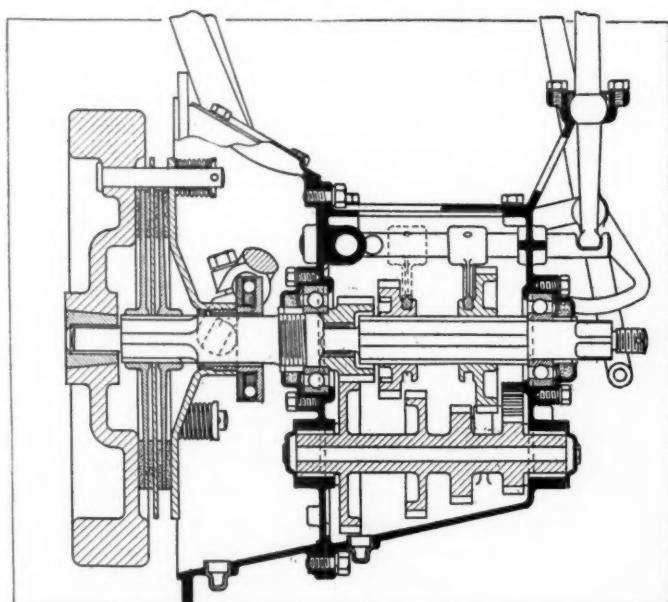
more than three speeds in the gearset and to provide four calls for higher cost, greater weight and increased opportunity for noise. It is to be doubted whether the four-speed gear will ever return to favor; more likely is it that some totally new form of transmission will replace the gearset altogether.

Weight Decreasing

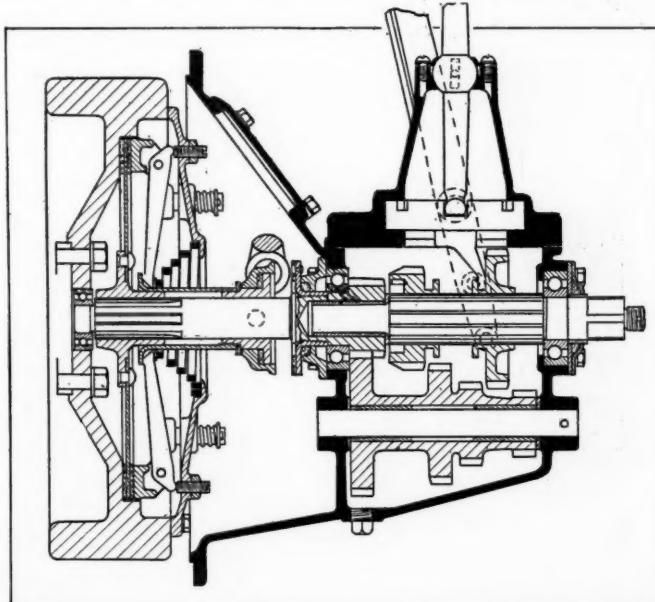
Weight has been cut conspicuously for 1916, but this has not been done by alterations in gearset design so much as by the changes in motors. The general decrease in dimensions and increase in crankshaft speed has lowered the tooth pressures very greatly, so a far smaller gear is amply strong. At 2000 r.p.m. 40 hp. can be transmitted by a gear with half the tooth strength needed to transmit 40 hp. at 1000 r.p.m.

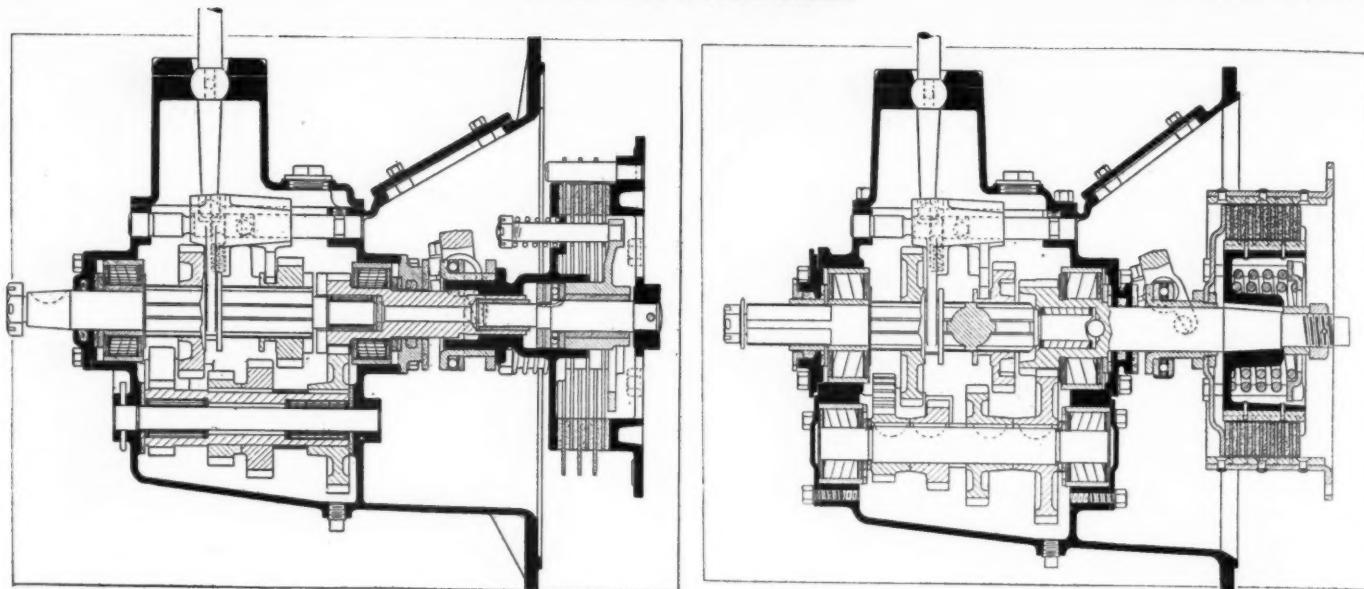
In the gearsets odd half pounds have been cut by simplification, notably in the lever mounting, and center control is, of course, lighter than any other system.

It is unquestionable that the ease of gearshifting is very



Left—A simple design made by the American Die & Tool Co. Features are the special clutch with a two-disk inner member of very light weight, and the hollow countershaft. Another point of ingenuity is the method for mounting the shift lever and its engagement with the extreme ends of the striker shafts. Right—Another simple gearset made by the Mechanics Machine Co. which also has a light clutch, this time with a single plate. The countershaft is pinned to the case and the gears bushed, while the sliding shaft has a larger number of splines than usual





These two examples of Covert transmissions differ mainly in the clutch design and in the size of the bearings. That on the left has a stationary countershaft and long roller bearings while the other has the heavy duty type of bearing and a revolving countershaft. Note how a steel ball inside the spigot is used to take accidental thrusts from the propeller shaft on the gearset shown on the right

much greater on certain cars than on the average, and almost always it is found that the cars with the easy shift have very light clutch parts. There are some clutches which are so light that it is hardly possible to make a sound in shifting gears however ill judged the time for changing may have been; but the majority need some practice before proficiency is obtained.

Center Control Aids Gearshifting

Center control, and the unit power plant, which two things cut down to the minimum the number of connections between the shift lever and the gears to be shifted, have made the actual lever movement very light and easy on practically all gearsets, but there is still room for improvement in clutches. Where the increasingly popular dry disk type is used it is possible to arrange the inner member to be of extremely light weight and gearshifting becomes correspondingly easy. A very light clutch needs no clutch stop or brake and with it changing either up or down is equally easy.

With a cone clutch the same lightness cannot be obtained, but the weight can be fairly low and the provision of a good

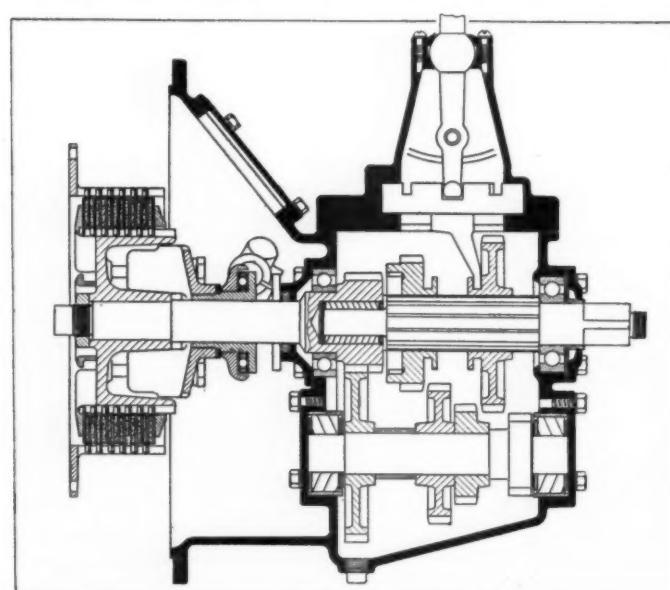
brake makes shifting upward as easy as with a lighter clutch. Where the cone clutch fails is in making a quick shift from high to intermediate, for it cannot be speeded up without a double pedal action which very few drivers ever learn to perform. Of course, there are advantages with the cone clutch, notably simplicity, ease of renewing the wearing surface, and facility of spring adjustment. The best of all clutches *when in perfect condition* is the multiple disk running in oil, but it is costly to make and difficult to keep in good condition. The nature of the oil is a trouble, cold weather is liable to cause sticking and the average repairman is not very clever with the type. Hence its use is confined almost to very high-priced constructions where efficiency is insured by an expensive design.

Dry disk and cone still just about hold their relative positions of equality, habit probably accounting largely for the continuance of the cone, and the manufacturer's natural dislike for giving up a thing which has caused him no trouble in the past.

No Ratio Formula Exists

Among gearset makers there is some difference of opinion as to the proper proportion of second speed to high, and low to second. Some consider that the intermediate ought to be fairly close in ratio to the high, arguing that a car will do nearly everything on these two gears and that the ease of shifting produced by a small drop in ratio encourages the driver to utilize his engine to best advantage. Others take the intermediate as the geometric mean between high and low, yet others leave the matter to the chassis designer and make ratios to suit their customers' ideas. There is no rule or formula, considering the power and weight of the car, which is used generally in determination of gearset ratios, a rather remarkable state of affairs which suggests a useful subject for some investigator to tackle as subject for an S. A. E. discussion. Theoretical ideas seem to be applied in very few cases and the discovery of some good empirical rules ought to be useful.

In conclusion, it may be remarked that the automatic gearshift, whether controlled by springs or by electricity seems to have made no progress whatever during the last year. The electric gearshift has undoubtedly been developed to a state of considerable efficiency, yet no automobile manufacturer has considered it worth its cost as a selling adjunct. This is not in accordance with the expectations of a year ago so we must await the 1916 season for possible developments along this line. They may or may not transpire.



This is a slightly heavier pattern of Mechanics Machine Co. gearset to that illustrated on the preceding page. Larger bearings of heavy type are employed and a roller spigot instead of the plain bush

Aluminum Discussion Evokes Enthusiasm

J. E. Diamond's Paper Stirs Detroit Engineers to Appreciation of Alloy Pistons—Future of Aluminum Production Explained by President of Aluminum Company of America

DETROIT was filled with the word aluminum on Nov. 12 for there was quite a gathering in the city of men whose names stand for aluminum in raw and finished states. They had come to hear J. E. Diamond's paper on aluminum pistons, to see what engineers thought of the latest way of employing the useful metal.

Firstly, there was A. V. Davis, president of the Aluminum Co. of America who, after the reading of the paper, held the close attention of the crowded hall while he explained how the price of aluminum came to be where it now stands, and gave a ray of hope for the future. Then E. E. Allyne and W. P. King, president and vice-president of the Aluminum Castings Co., and C. B. Bohn, general manager of the same firm, were present to represent that part of the aluminum industry most closely in touch with the automobile trade. As luck would have it, Louis Chevrolet has just completed his all-aluminum racing motor and the aluminum chiefs enjoyed an hour spent on an outlying road where 90-mile-an-hour joyrides were indulged in, the engine showing a splendid amount of life.

Large Attendance for Paper

The convention hall at the Pontchartrain Hotel was crowded when, after a brief business session, J. E. Diamond read the paper which was published in *THE AUTOMOBILE* last week. As soon as he had finished, A. V. Davis was called upon to talk on market matters and the following gives his remarks in condensed form:

I want to say, most emphatically, having been with the Aluminum Co. of America for twenty-six years, that it is not only the desire, but the intention, both now and always, that the Aluminum Co. of America will make all the aluminum that anybody in the United States wants to buy. So that, so far as any future shortage is concerned, if you will only give us a chance and let us alone, we will soon be in the position that we have been in for many years, of making more aluminum than you gentlemen are willing to buy. I suppose that you would hardly believe that March, 1915, was the last month for a period of considerably over five years that the Aluminum Co. of America did not make more aluminum than you gentlemen bought, or any other gentlemen in the United States. Month after month we stocked aluminum, until we went into the month of April, 1915, with not only the biggest stock of aluminum that we ever had, but the biggest stock of aluminum that was ever known in this world. If you gentlemen had been willing to buy, during the last four or five years, considerably more, I can safely say that we would have made considerably more, but we made at least all that could be sold, or at least, all that we were able to sell.

Then in April, 1915, came the beginning of the revival of business. The war had already broken out, but in this country we did not, in general lines at least, feel the effect of it until April or May. Then our stock of aluminum began to be depleted. There were several causes for that, all work-

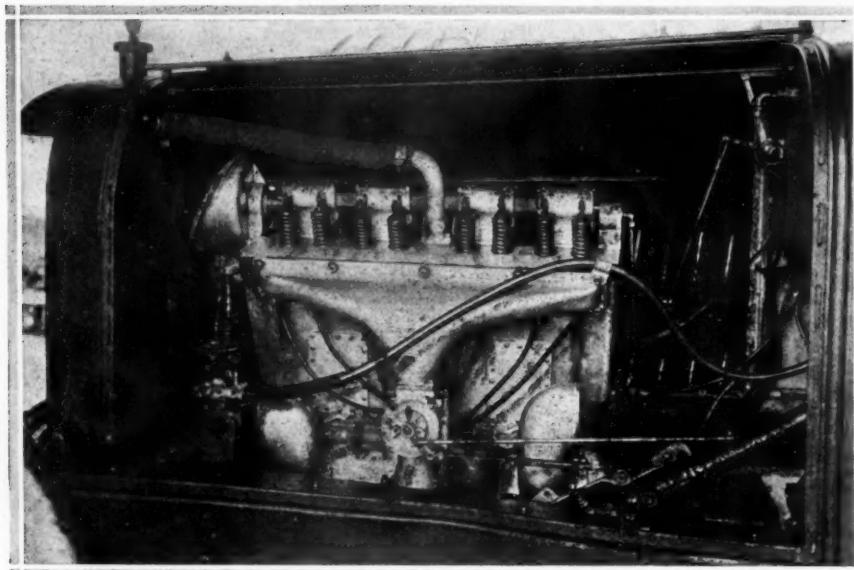


Left—A. V. Davis, President the Aluminum Co. of America. Center—E. E. Allyne, President the Aluminum Castings Co. Right—W. P. King, Vice-President the Aluminum Castings Co.

ing to the same end. The first was that the consumption in this country began to jump up very materially. War orders for this, that and the other thing; war orders for automobiles; war orders for automobile trucks; the general revival of business, all tended to make a very substantial increase in the consumption of aluminum. Furthermore, the war itself shut off the importation of aluminum; and there I touch what is to us perhaps a very tender subject, as you can easily understand. We recognize the right of anybody to buy aluminum wherever they wish. We certainly do not pose as the owners of the aluminum industry, although we are proud to say that we are the greatest in the aluminum industry; but, of course, we cannot very well maintain plants of a sufficient size to make enough aluminum to supply this country, and wait patiently for five or six or seven years, until, for some reason or other, there happens to be a shortage, when we can start up those plants, and run them for a year or two until the foreign importation comes on again.

Cessation of Imports Causes Shortage

So far, therefore, as the cessation of importation has anything to do, and it has a great deal to do, with the present shortage, that is something over which we have no control. I feel in a rather delicate position, representing the only manufacturer of aluminum in the country. I wish there were twenty-five others, while I am speaking on this point. Then I could talk about the aluminum industry very much as you can talk about the automobile industry, without seeming either egotistical or seeming to beg for favors. But it is a matter of fact, as you all will see, and must see, that whether we are talking about dyestuffs, or whether we are talking about aluminum, or whatever we are talking about, that it is a very difficult thing for the American manufacturers of any product to prevent or to avoid shortage in their particular line, unless, year after year, when there is



The aluminum motor in Louis Chevrolet's special 300 cu. in. racing car, now being tested at Indianapolis

no shortage, the American consumer buys of the American manufacturer.

Canadian Plant Under Embargo

Another point, which I will just mention because I want to tell you all there is about it, so far as I see it, is that we have a plant in Canada, as no doubt many of you know, and from that plant in Canada we have always brought a very substantial tonnage into this country; but this year, and also for 1916, when we announced our plans and made our contracts to send in this usual and normal amount of aluminum, the War Office in London stepped in and told us that they needed that aluminum worse than you people did, and that no matter what we wanted to do with it, they were going to take it; and we struggled a little bit, with the result that an embargo was issued, and no aluminum can go out of Canada at the present time, and probably that will continue during the war. So that is the condition, which was rather unexpected, and very unfortunate from our standpoint, and equally so, of course, from the standpoint of the industry.

So much for the shortage as it exists; but you are not especially interested in that; perhaps I have dwelt too long on it. The only cure, aside from the cure that I have already mentioned, is for us to make more aluminum; and, in accordance with our practice and our policy for twenty-five years, we started at once to build more plants. We have laid out a schedule calling for an expenditure of considerably over \$20,000,000, this year, and next, but, in our business, it takes a long while to get those plants into shape, get them finished, and it will be about May of next year before we begin to get the results of the more recent of these developments; and it will be, we anticipate, December of next year before they are finished.

It is rather surprising, even to me, when I look over the figures, and see that even now we are making 18 lb. of aluminum to 10 lb. that we were making in 1914. We have screwed up the production a little here, and a little there, until we have made an increase of 80 per cent even now; but when we get these new plants going, we will have such a very substantial increase in production, that unless the consumption of the country should be substantially more than it is now, we will be able to supply it, and have plenty to spare, even though none is imported.

That, I take it, is what you want to know, more than anything else. Although I am very sorry that we have not got the plants finished yet, you can easily appreciate that this

condition is not altogether our fault—we did not, at least, bring on the war—if you will only be patient, for a little bit, we will have the production, and insofar as that bears upon the plans for the use of aluminum, I will give you the information for just what it is worth, and you can figure out yourselves what you ought to do in the premises. All I can say is that we are doing everything that we possibly can.

How Aluminum Is Made

The chairman also suggested that I should say a word regarding the process of making aluminum. That seems like bringing coals to Newcastle, to speak to a group of engineers on a manufacturing subject; but it is a bit interesting just in this connection, because it will explain to you why it takes so long to complete a plant to make aluminum.

The ore of aluminum exists in great quantities. There is no shortage there. It is only a matter of buying more picks and more shovels to double the output; no trouble with regard to the ore.

The next step is to treat this ore, by a very complicated chemical process, into a pure product, which we know as alumina, being the chemically pure oxide of aluminum. That is, for a plant to make a substantial increase, you have to spend \$1,000,000. That, perhaps, gives you a better idea of how long it takes, because you all know, when you start out to build a \$1,000,000 plant, it takes a lot of time, no matter how fast you may work; so that even though we had all the power, and all the other facilities, it takes a lot of time to build an aluminum plant, but the real time is consumed in getting the power. If you gentlemen will pay a little more for aluminum, we could afford to make it by steam power, and possibly hustle up the plant a little quicker; but I have not found anybody yet that would pay any more than they had to, for aluminum; so we have to use water power as the cheap source of power. That is the great expense; and the *sine qua non* in the manufacture of aluminum.

Water Power Scarce

In these days, it is not an easy matter to even get water power. Water power on navigable streams is practically an impossibility, as you perhaps know. I am not here to discuss the political side of it, but as Mr. Cannon, the former Speaker of the House of Representatives once put it to me, any water power bill that you could get through Congress, the President would not sign, and any water power bill that the President would sign, you could not get through Congress; and that is just about the situation.

Perhaps you will be surprised to know that there has not been a water power bill through Congress since the early days of Roosevelt as President, *not one*. We started in to get together a big water power on the St. Lawrence River. We have a lot of money invested in it; but until this deadlock is broken between these people who are conserving the interests of the public, and those who are willing to give corporations a little chance, I do not suppose that water power can ever be developed. That shuts the aluminum manufacturer down to water power on unnavigable streams, and those are necessarily small, and require the purchase of large amounts of property, and that takes a great deal of time. Of course, in this country we do not have the power of condemnation. We have, however, just gotten together a very large amount of property in the South, which we anticipate will be enough to supply the increase in the demand for many

years to come, and I might say that this project is not included in our plans for increase for next year, although we are starting on it already, and I think that, if what we are making next year is not enough for the demands of 1917 and 1918, that these other projects that I speak of, in the South, will come along, and it is our intention to push them just as fast as the market will take the product.

Immense Power Needed

But, after you have got the water power together, you then have to develop it. You take in these days, an increase in the aluminum business means 50,000 hp. or 100,000 hp. to be of any real good, and you, as engineers, all know that to develop a 50,000 or 100,000-hp. water power proposition is no easy task, and two years is a very short time for the most favorably located water power. Three years, four years, or five years, is much nearer the average, and that is where the time is all consumed. So that, with us, it is a question of foreseeing the market, which we always try to do. We are always spending money, and trying to get ready, not for next year, but for four or five years from now, and I feel very certain that the plans that we have on foot now will carry us through, even though we do not have the presumption of importation, which, of course, we will have as soon as the war is over.

If there are any questions you gentlemen would like to ask me, Mr. Chairman, I would be very glad to answer them, except as to how old I am, and how much salary I get.

E. E. ALLYNE—It has been suggested that perhaps this shortage may be partially due to the fact that the Aluminum Company of America may have taken on some war orders. I think perhaps some of these gentlemen might be interested in having a statement from Mr. Davis in that respect.

A. B. DAVIS—I can answer that very simply by saying, that we have not sold 1 oz. of aluminum for any war order, directly or indirectly.

After the passing of a hearty vote of thanks to Mr. Davis the discussion of the paper proceeded and the following gives the gist of the remarks made by the different speakers:

Discussion Centers Round Lubrication

A. LUDLOW CLAYDEN (THE AUTOMOBILE)—Relative to oil pumping, Mr. Diamond, in mentioning the growing practice of drilling a small number of holes immediately below the lower ring, has not mentioned the accustomed number; and I believe this number varies considerably. I think it would be interesting to know what, in his experience, the best number of these $3/32$ in. holes is.

Another matter on which I am not quite clear, is, to what extent he favors or does not favor the scraper ring.

JAMES E. DIAMOND—Relative to the first question, to my best knowledge, six holes are used. I do not remember seeing a case with any sized piston, where there have been fewer than six used; of course, these being spaced evenly.

Relative to the scraper ring, I am entirely non-committal as to that. If you can get along without it, so much the better; but in a lot of cases, the motor will persist in smoking, and it is absolutely essential and absolutely necessary to go to the scraper ring to eliminate that.

K. W. ZIMMERSCHIED—I do not know much about piston design, and I am not going to discuss it from the design standpoint; but Mr. Diamond made one remark about grinding these pistons. Now, we have had a little experience with grinding as soft a material as aluminum, and I would look for a very bad source of

trouble from that. In a material as soft as that, you will very likely get material from the grinding wheel embedded in the aluminum, and that acts as a lapping agent on this wall of the cylinder, so that with that type of metal, I should say, by all means, the machining or lathe operation would be better.

With regard to the coefficient of friction, I do not just follow Mr. Diamond's argument. We have done a great deal of work trying to find what we might call the wear coefficient of steel against steel, and different bearing metals against steel, and so forth, and the upshot of all our experiments has been that if you have got a film of oil there, you do not get any wear; that the wear that comes is due mostly to the fine grit and the abrasive material that gets into the oil after it has been in use for a while, but if you have always clean oil, and always have a film of oil there, you do not get any wear, and hence the coefficient of friction would not seem to have any great bearing on this matter.

Of course, on the question of a standard piston design, we are very keen for that. We certainly hope that the time will come when we can have a series of standard pistons.

Friction Co-efficient Low

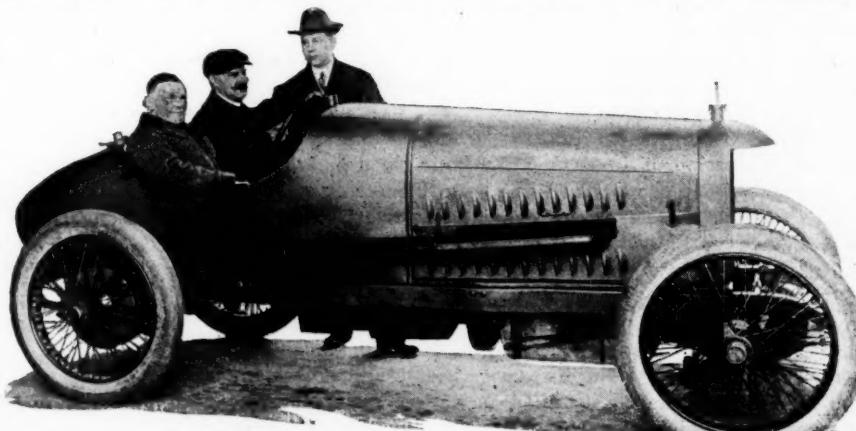
J. E. DIAMOND—That question which Mr. Zimmerschied has brought up, has been put to me before, but the fact remains that in a series of fairly careful tests that we have run out at the plant, we have gotten a coefficient for the aluminum, or rather the Lynite alloy that we use in the Cothias process, of about half that of iron. The conditions were not exactly analogous to those the piston would meet in the motor. We ran blocks, which have a projected area of 1 sq. in., with a load of 1000 lb. per square inch, at a speed, or equivalent speed, of 1000 ft. per minute of travel, we got a coefficient of friction of about $8/1000$, that is, $8/10$ of 1 per cent. Whereas, with iron, we get in the vicinity of 1.4 or 1.5, that is, $1\frac{1}{2}$ per cent.

I quite agree with Mr. Zimmerschied that if you have a perfect oil film, there ought not to be any wear, but I do not believe you ever get that condition where pistons do not show wear. Pistons do show wear, whether they are iron or aluminum.

On the grinding proposition, if you get the right wheel, there is not very much trouble. Two or three people have solved that problem very nicely, but the fact remains that I think the lathe job is a better job, and cheaper one.

C. C. HINKLEY—I would like to ask Mr. Diamond, just what is going to happen when some of these quick carbon removers use the oxygen flame on the piston head to remove the carbon; if he has taken that into consideration?

J. G. VINCENT—I have conducted a number of tests purposely to determine that one point. I was not worried, be-



Louis Chevrolet's racing car, which has an aluminum motor. Chevrolet is at the wheel; beside him is J. E. Diamond, author of the paper, and standing behind is C. B. Bohn, general manager the Aluminum Castings Co.

cause it was my idea that as soon as the carbon deposit, or whatever it might be, was burned off the piston, the fire would go out. In other words, it requires carbon to cause combustion, and it seems to work out about that way. At least, we have run one motor something considerably over 22,000 miles, and we burned it out a number of times, when there really was not anything to burn out; just to see if any harm would come from putting the flame in there, or attempting to put it in, when there was not any carbon in there, but just a little oil. I personally examined that motor after it was taken down, and I could not find any trace whatsoever of the effects of the burning-out process.

Now, as to the coefficient of friction, I am inclined to agree with Mr. Zimmerschied that the coefficient of friction does not amount to very much, where you maintain a film of oil, of even reasonably good lubricating quality.

L. V. SPENCER—Is there very much of a tendency to offset the wristpin in the pistons? I understand that some of the designs are doing that, for reasons of stopping the slap. I would like to know how many of them are doing it, and what the results have been.

J. E. DIAMOND—I guess it is generally known that the Packard company have offset the wristpin in their pistons for quite some time. I heard of a rather amusing instance the other day, where one company that had been doing a lot of experimenting along that line, had offset the wristpin the other way, and claimed they got better results. So I think this question of slap is very largely psychological.

Objections to Standard Piston

A. P. BRUSH—In discussing some of the points that Mr. Diamond has brought out in his paper, I want to say, first, that, as I understand it, Mr. Diamond has been more of an instrument of transmission than an instrument of origination. His suggestion for the standardized piston, as he says, is largely the result of making a composite picture, so to speak, of the various pistons that he has been called upon to make, so, if I have points of exception to take to Mr. Diamond's paper, I feel it is rather with the rest of you who have to do with engine design, than with Mr. Diamond.

There is one point I should like to ask Mr. Diamond about, because it has a considerable bearing on some of the things I want to say. He says, "Also the piston side pressure may be increased without unfavorable results"; and then, later on in the paper, he makes a plea for a longer piston, for more wearing area. He says that is advisable with an aluminum piston. Those two statements seemed to me a little contradictory. I would like to ask Mr. Diamond if he will harmonize them, please.

J. E. DIAMOND—I think we can reconcile them in this way. In the first place, I have tried to justify the piston which is designated as the hour-glass piston. On that one, the bearing surface is cut away, so that if the coefficient of friction is a factor, and is less than cast iron, we can have a small bearing surface, and at the same time have no greater friction load. On the other hand, I am very partial toward the long piston, where we do not have to use the wiping ring. It is just a question of justifying the hour-glass piston, where it is necessary to use a wiper ring. Do I make myself clear?

A. P. BRUSH—I want to ask about this question of pumping oil, and on the question of the durability and wear of the aluminum piston, and the plea for longer pistons.

It seems to me that this question of piston wear, and pumping of oil, is worthy of very serious consideration, as is the question of standardization. I do not want to be considered a reactionary, but I believe heartily that standardization, if you standardize the right thing, is an excellent instrument of progress; and if you standardize the wrong thing, it is a very efficient obstruction to progress.

Mr. Diamond speaks about the difficulties experienced with aluminum pistons. Speaking of piston slap, as the first

point, then the other has to do with the pumping of oil in high-speed motors, when running at low speeds; I think Mr. Diamond meant rather, when running under light loads.

In regard to this question of pumping oil, and wearing of pistons, the number of holes for oil, the elimination groove, my experience with a number of motors does not coincide with the conclusion of Mr. Diamond, or rather, I should say, the conclusion which Mr. Diamond has arrived at by considering the various piston designs which have been submitted to him. I think, before we can come to an intelligent conclusion in regard to this question of piston standardization, we must know whether our engine design, outside of the piston, is up to—shall I say, the standard, or up to the future standard practice.

I am under the impression that the great majority of these piston designs submitted, are used in connection with what I should call a compromise oiling system. That is, an oiling system where the amount of lubrication for any given speed is constant, irrespective of the load, which, in natural consequence, means, I believe, that an amount of lubrication has been chosen which will, so far as possible, meet the conditions of full power and full speed, and at the same time, not give too much excess lubrication at lower powers, and lower or various speeds. It does not seem to me that an oiling system of that kind is quite worthy of standardization. It would seem reasonable to assume that the amount of oil given an engine at any one speed, should logically be in proportion to the work that engine is doing, irrespective of what that speed may be. If we do that, and if, as is entirely possible, the piston is the last working element of the engine to receive lubrication, I see no reason why the lubrication of the piston should not be so accurately controlled, that there ceases to be any problem of over or under lubrication, and a very considerable number of tests bears that out.

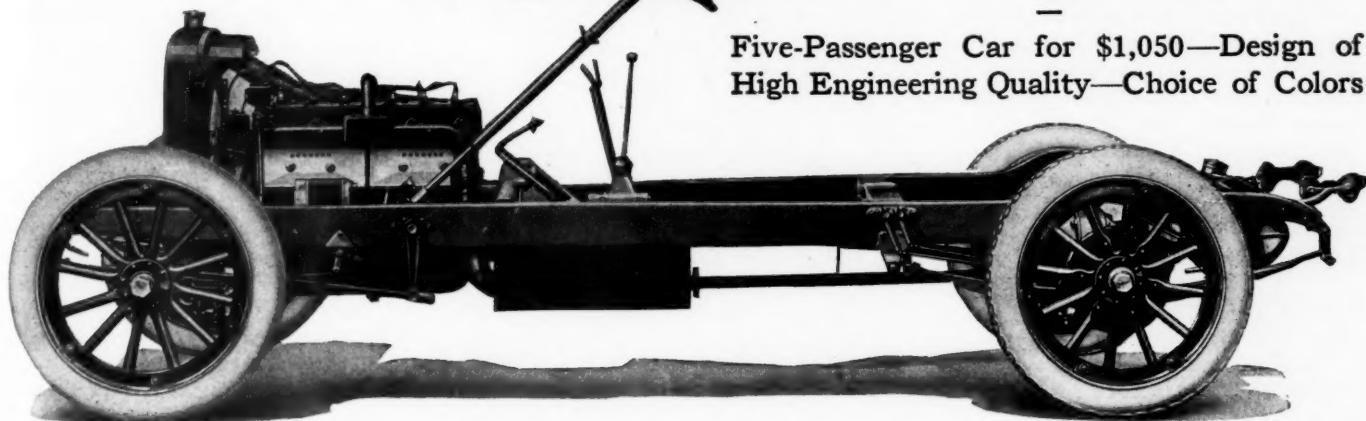
I should like to ask Mr. Diamond to what extent has he data as to the kind of oiling system used on the various motors for which they have made the Lynite pistons.

J. E. DIAMOND—That is a puzzler. I know there have been two or three pressure systems. I do not know of any in which the pump is inter-connected with the throttle.

A. P. BRUSH—Of course, the pressure system is also, in a measure, a compromise system, unless it is inter-connected with the throttle. At least, I think we are justified in looking with suspicion upon a proposition to standardize a needlessly long piston, involving a needless amount of material, especially at the present price of aluminum; or a piston in which the piston pin is needlessly far from the piston head, because that problem will also be aggravated by any imperfection of the oiling system.

In regard to the drilling of holes for oil drainage under the lower ring, my experience has been that, with an inter-connected oiling system, none are necessary. The practice which I prefer is to have the groove there, not for the purpose of keeping excess oil out of the combustion chamber, but for the purpose of insuring adequate lubrication of the piston pin. That is secured by draining this oil groove below the lower ring, into the ends of the piston pin holes, and providing suitable oil passages, so as to distribute that oil. If the piston pin is loose in the piston, those grooves will take one form; if the piston pin is tight in the piston and loose in the rods, they naturally take another form. But in either case, that is an excellent method of insuring, I should say, copious lubrication of the piston pin, because there is always some leakage around a piston at the moment immediately following ignition of the charge; and those gases leaking by the three packing rings, will, by a process of following the line of least resistance, force a considerable part of oil in that groove through any suitable oil passages, to the piston pin bearing, and with the least oil which will adequately lubricate a piston, that method will insure an abundance of lubrication to the piston pin.

Chalmers Brings Out Light Six



The new Chalmers light six chassis which sells for \$1,050 as a five-passenger touring car, with color optional. Note depth of channel frame

IT is becoming recognized that it is possible to build a really high-class, well made and finely finished six-cylinder automobile for about \$1,000, and the latest addition to this class is a new Chalmers product; a thoroughly handsome five-passenger machine with chassis work of the quality always associated with the Chalmers name. The new car is every inch a Chalmers, it is good to look at, comfortable to ride in, powerful for its size and comparable with the best in engineering quality. With a five-passenger body and full equipment the price is \$1,050, and this includes finish in a choice of colors. It is the type of automobile that will appeal to the owner who likes a car with a distinctive individuality.

Briefly, there is a unit power plant with a six-cylinder motor $3\frac{1}{4}$ by $4\frac{1}{2}$ in., the wheelbase is 115 in. and the springs are long semi-elliptics. Axles are Timken, the new semi-floating pattern being used for the rear. A point of special merit is the frame, which is exceptionally deep and rigid, while the body is as well finished internally as it is pleasing in external lines.

Motor Produces High Power

The overhead valves used for the Chalmers six-40 are not employed for this smaller car, but the new engine is typical of modern L head design, giving its maximum power at over 2500 r.p.m. and at this speed it produces 1 hp. for each 5 cu. in. of displacement. The formula power is 25.4 hp. and the actual maximum over 45 hp., the displacement being 224 cu. in.

With the desire for eliminating vibration, a very large diameter has been chosen for the crankshaft, the three bearings being $2\frac{3}{16}$ in., $2\frac{1}{4}$ in. and $2\frac{5}{16}$ in. diameter respectively, reckoning from front to rear, the difference in diameter being to allow for economical, accurate manufacture. Furthermore, as a vibration reducer and efficiency increaser aluminum alloy is used for the pistons, these being made by the permanent mold process. The connecting-rods are quite light forgings, so the total reciprocating mass is small for the bore.

Valves are $1\frac{1}{8}$ in. with a lift of

Five-Passenger Car for \$1,050—Design of High Engineering Quality—Choice of Colors

$5/16$ in., and special attention should be given to the lightness of the tappets, and the method for attaching them. Cylinders and crankcase are a unit casting, but the tappets are assembled in sets of six in two cast-iron racks which are afterwards bolted in place, this making for accuracy and facilitating the assembly. Plenty of space is allowed the valves in every respect, both as to port area and cooling water and around the tappets. A detachable cylinder head makes for accessibility and ease in removing carbon deposit.

Oil Pump a Separate Assembly

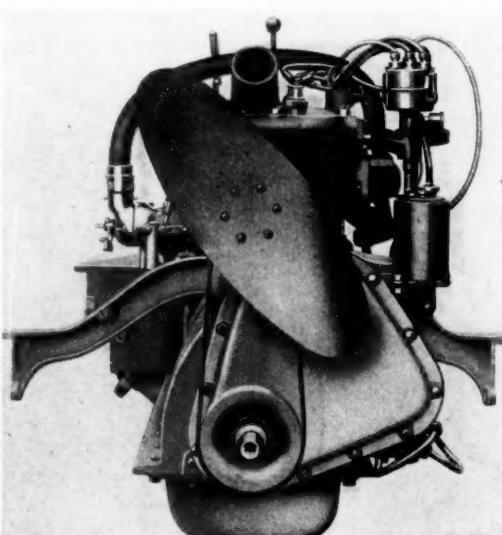
One of the neatest parts of the engine is the oil pump and ignition assembly, this being a separate unit bolted to the side of the crankcase at the front end on the left side. Every part is accessible to the last degree and the outside situation for the oil pump helps in cooling the oil. It may be remembered that the Wisconsin-Stutz racing motor has this same feature.

Pressure feed to the main bearings and dip troughs for the remainder of the engine form the lubrication system, while there is an easily visible level gage on the right side of the motor adjacent to the filling cap. As is shown by the photographs, the motor is externally simple, while the drawings show this simplicity to be characteristic of the invisible as well as the visible parts of the engine.

A peculiarity is the fan, which is probably the simplest two-blade form ever conceived. It is well known that a two-blade type is just as efficient as any other, but it has remained for the Chalmers engineers to show that it can also be the cheapest. A simple piece of stout sheet steel is cut, and riveted to a hub at the middle, and then the ends are bent a little to give a pitch to the blades. The extremely inexpensive driving pulley on the crankshaft is also a clever bit of design as this is practically all press work.

Stampings are used largely throughout the chassis, the Chalmers company having a good equipment for making this class of part. For example, the gasoline tank is pressed from two pieces of steel, thus being immensely strong and cheap withal.

It is on the side of the gearbox



Front end view of new Chalmers six motor, showing simple type of two-blade fan

that the starting motor is situated, this engaging the flywheel by a Bendix pinion. The motor is of Westinghouse manufacture and the generator takes its drive from the same pinion as that connecting with the oil pump and ignition assembly. Using this location for the starting motor adds to the space around the engine, and thermo-syphon cooling being employed also relieves the power plant of an accessory. The distributor is a Remy product and the carburetor a 1-in. Stromberg.

Light Clutch Aids Gearshifting

Bolted to the motor are the three-speed gearset and the clutch, the latter being the same dry-disk pattern used on other Chalmers models. The inner part is very light in weight, this aiding gearshifting to a pronounced degree and a generous use is made of stamped parts. Having multiple springs the adjustment is very easy, and all parts of the clutch are accessible from beneath, the flywheel being inclosed only as regards the upper portion.

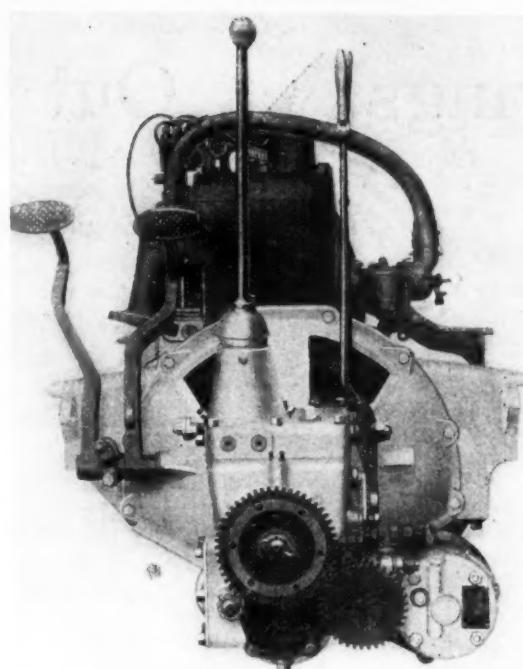
In the gearset the outstanding feature, apart from a general compactness, is the size of the Hyatt roller bearings used. Oil is the recommended lubricant, not grease, and there is a brass cock to gage the proper level. There is a plain bearing at the rear end of the main shaft to take thrusts due to gear shifting or to the propeller shaft, so that the ball bearing in the clutch and the thrust washer on the front part of the main shaft are practically the only ball bearings used in the car, since the axles are Timken equipped throughout.

Hotchkiss drive is used, with a tubular propeller shaft, the rear springs being half elliptic 54 in. long and 2 in. wide, and the rear axle is the new Timken semi-floating pattern with spiral bevel drive and brake drums 12 by 2 in. The gear ratio on high is 4.75 to 1, and the tires 32 by 4 in. so the motor speed is fairly high, the maximum peak of the power curve being reached at a little over 50 m.p.h. At 1000 r.p.m. the car speed is 20 m.p.h. and at 1000 ft. per min. piston speed the car rate is just 15 m.p.h. and the displacement per mile is 670,000 cu. in.

The new axle is typically Timken, having the pressed steel case and taper roller bearings throughout, but the road wheels fit directly upon the ends of the drive shafts. Brakes are, of course, both internal and external to the same drums, the inside brakes being expanded by a cam action and the regular Timken adjustable toggle is used for the contracting brake.

Strong, Light Frame

It has been mentioned that a feature of the car is the strength of the frame which is no less than 5 in. deep at the center and for the larger part of the length. Quite a

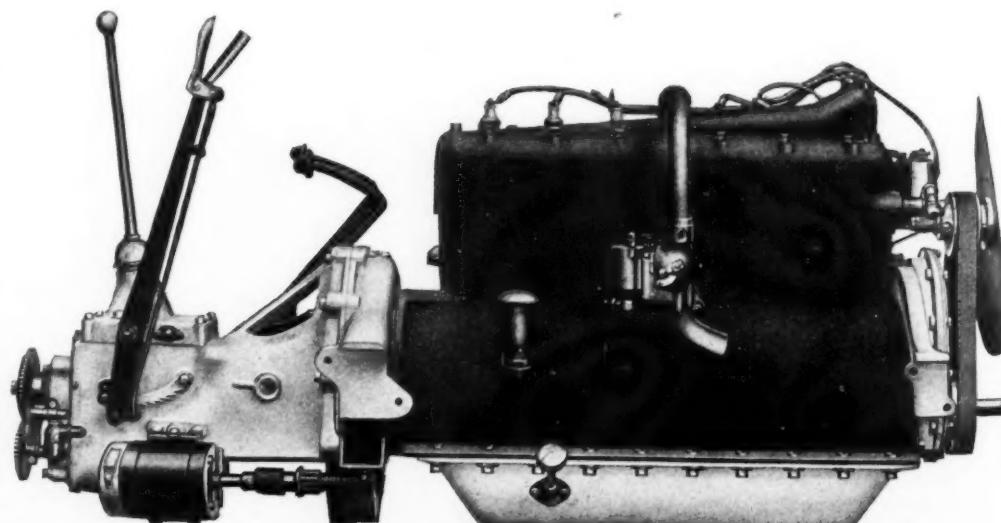


Rear end view of Chalmers light six motor, showing mounting of starting motor beside gearbox. Note shaft for ignition drive at left of motor

switch, ammeter, etc. It is a matter of minutes only to remove this wiring unit and replace it by another, so if any fault should develop it is as easy to rewire the car as it would be to change a tire almost.

In external appearance the new Chalmers is a reduced scale model of the six-40. It has just the same graceful outline, and the hood and radiator are so alike that it is only in the presence of a six-40 that the difference in size becomes noticeable. At present only the five-passenger type will be made, but a roadster is in preparation. Inside, the front seat is wide enough to accommodate driver and passenger without cramping the former. Sitting at the wheel it is found that the levers are within easy reach, that the lamp switch which gives control of the dimmer can be operated without stretching and that the pedals have a light touch. In the tonneau 46½ in. width is allowed the three occupants, and there is leg room enough without a disproportionate amount of floorspace.

Upholstery is leather with a bright finish, the top is of



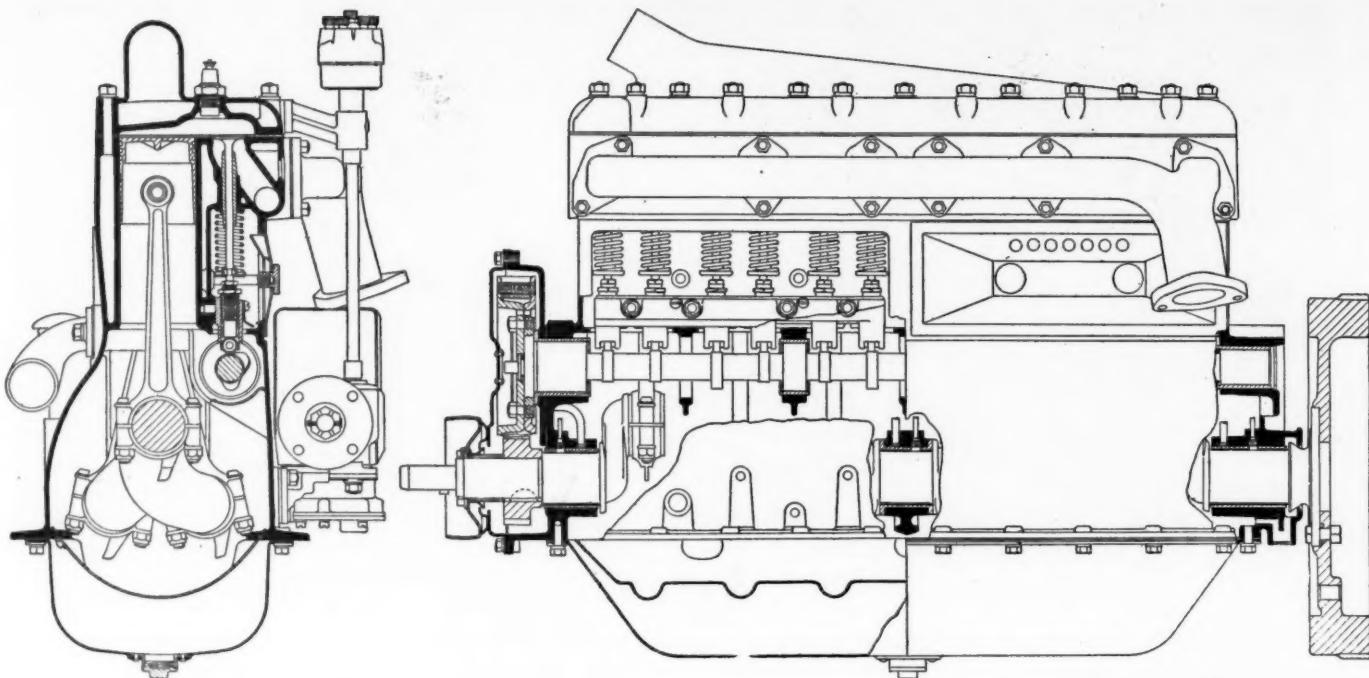
Carburetor side of motor used in the new Chalmers light six, showing starter mounted beside gearbox. Note clean design

thin steel is used, the thickness being only $\frac{1}{8}$ in. and the section is $2\frac{1}{2}$ in. wide. Over the rear axle the frame sides are raised in a short curve, and to give increased rigidity at this point the top and bottom flanges are bent over a little on their edges, so putting a kind of bead on the edge and stiffening the channel section just as a bead on the edge strengthens a fender.

Steering is by worm and full worm wheel, with an eccentric adjustment for taking up slack, and the connections are laid out well, ample size being given to the ball joints and yokes. The front axle is a Timken with taper roller bearings for the road wheels.

Before passing to the body, mention may be made of a detail of manufacture which should be much appreciated, this being the employment of a wiring unit, all wires being inclosed in a single outer tube. There is no junction box, since the wires attach directly to terminals on a plate which sets in the cowl board and carries the

switch, ammeter, etc. It is a matter of minutes only to remove this wiring unit and replace it by another, so if any fault should develop it is as easy to rewire the car as it would be to change a tire almost.



Chalmers new high-speed, light six engine. The extremely light tappets, the sturdiness of the crankshaft and the method for mounting the oil pump and distributor are distinctive features of this new engine

heavy material and clips neatly to the top of the windshield when erected.

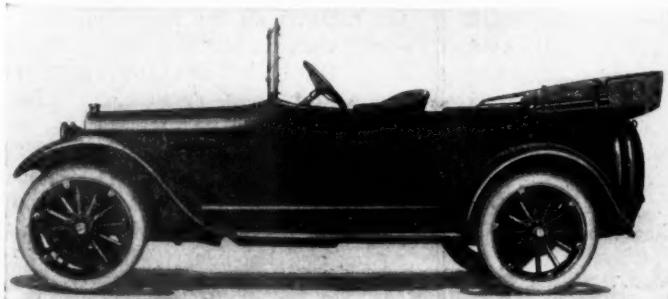
Undoubtedly one of the most attractive things about the car is the really excellent paint work, the colors, blue or dark red or green, are good, rich tints and the hood is painted too, not enamelled.

The fenders are a smoothly rounded shape and the whole machine is distinctly better than its photograph, a thing which is not an invariable rule. As to equipment, the rear tires are supplied with non-skid treads and all the usual accessories are included.

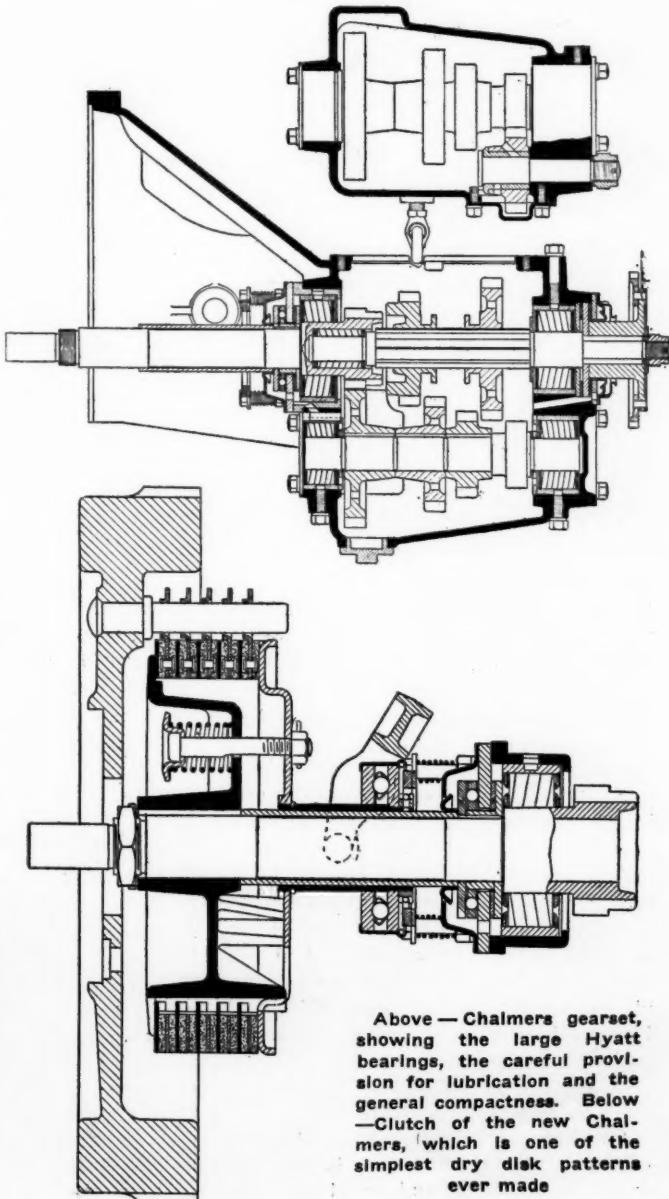
A Car with Character

It is not easy in a printed page to give an idea of how powerfully this car creates the impression of high quality. The design, on examination, shows excellent engineering, up-to-date in every particular, and yet free from debatable points. It is above everything else a sane design. The body is well upholstered and well molded, while having a highly finished exterior. The control is arranged conveniently; the fittings are all thoroughly good.

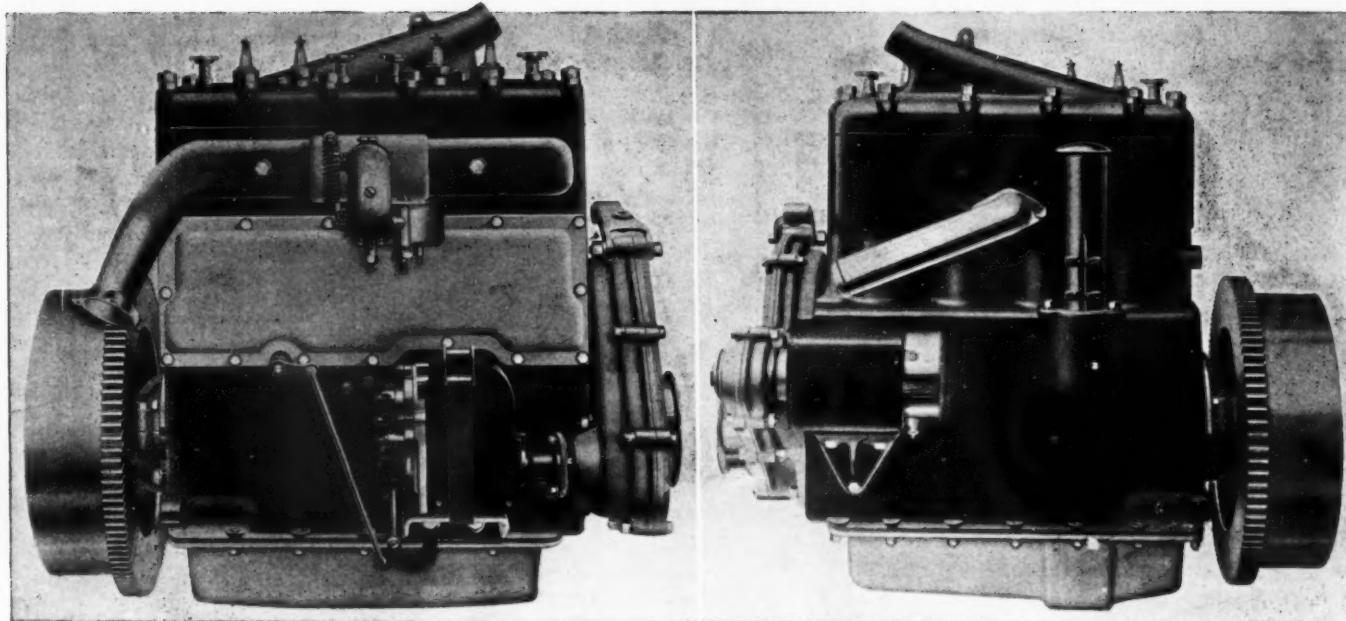
Yet this statement is hardly sufficient to explain why it is that the first sight of the new model stirs the imagination immediately. At once it is obvious that this, comparatively small, comparatively inexpensive machine is one that the wealthiest man would own with the same satisfaction in his purchase that he could bestow upon a much more costly car.



New Chalmers light six which sells for \$1,050



Above — Chalmers gearset, showing the large Hyatt bearings, the careful provision for lubrication and the general compactness. Below — Clutch of the new Chalmers, which is one of the simplest dry disk patterns ever made



Both sides of the 3 1/8 by 5-in. four-cylinder block motor used on the new Overland 75 which sells for \$615

New Overland Four Ready

Model 75 with 3 1-8 by 5 Block Motor, Electric System and Cantilever Rear Springs at \$615

OVERLAND'S new four-cylinder model 75, which has been expected for several months, is now ready. It is a typical Overland design with a 3 1/8 by 5 four-cylinder block motor and sells at \$615 with touring body and \$595 as a roadster. It has 104-in. wheelbase, 31 by 4-in. tires, electric starting and lighting with switch box on the steering column, cantilever rear springs, cone clutch in the flywheel and three-speed rear axle gearset. Left drive and center control are used.

Big Production Planned

The plan of the Willys-Overland Co., Toledo, Ohio, is to make these cars on an enormous scale, this being a big factor in setting the price, undoubtedly. However, the point is also emphatically made that the car is not to supersede any other model, the present \$750 model 83 being continued on as large a basis as heretofore. It will also not have any effect upon the output of Willys-Knights or of the six.

Economies in the manufacture of the new Overland 75 are seen everywhere in the new plant which has been erected especially for the making of this model. Progressive assembly schemes of almost astounding magnitude are installed, and this, together with the many design features of the car which have been worked out to make an efficient vehicle and at the same time render manufacture as simple as possible, give some inkling of how the big concern is in a position to make the vehicle at the price.

Differs from Former Practice

One has but to inspect the mechanism of the car to realize that it is different from former Overland practice. The

motor is a block with cylinders and crankcase in unit and the head detachable. Chains drive the magneto, camshaft and generator. The rear springs are cantilevers, and though the gearbox is in unit with the rear axle as in other models, the axle and the gear assembly are new in design. Many of the features of these parts are the result of the quest for quick manufacture and assembly.

Motor Is Compact

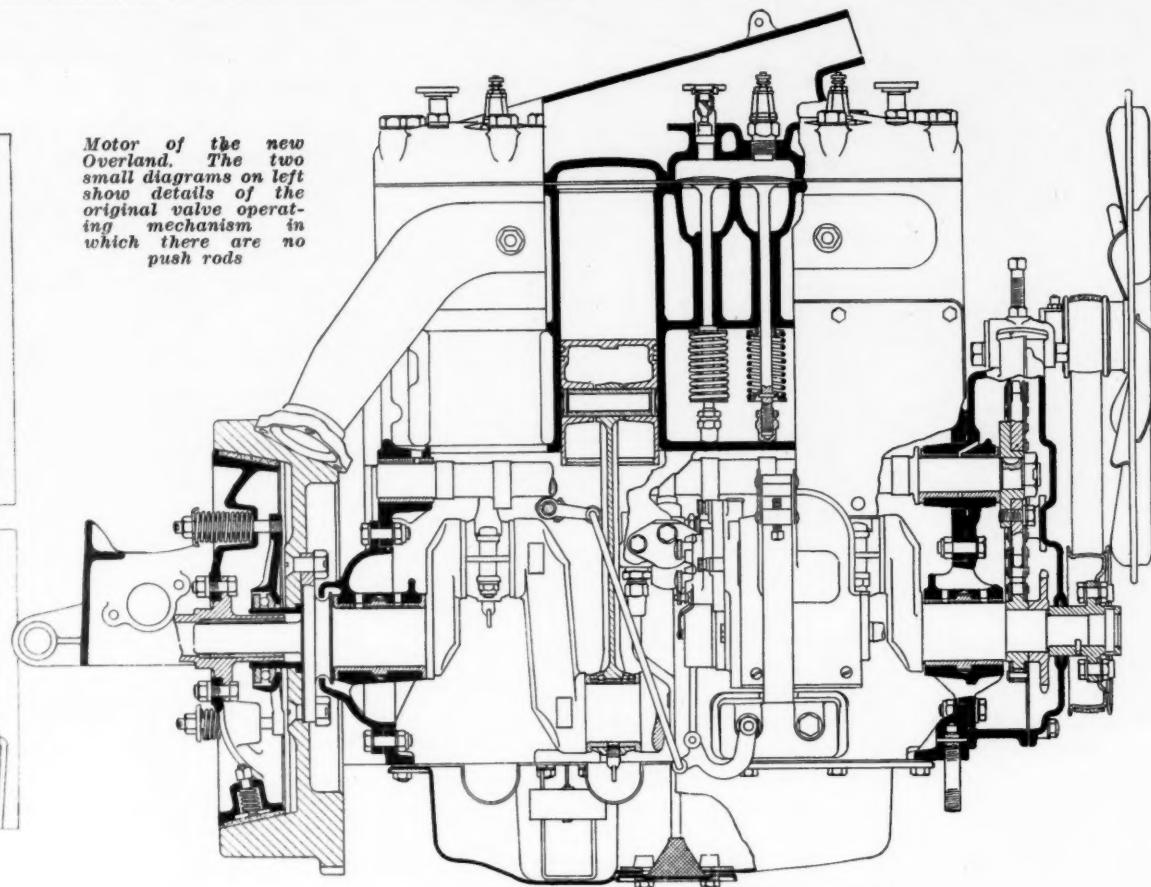
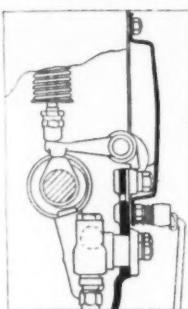
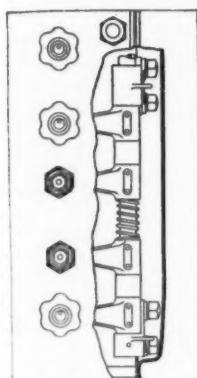
The motor is exceedingly compact, and lends itself well to quick assembly due to the way the parts are designed. For instance, the casting of all the cylinders and crankcase in one piece has not only the advantage of rigidity of construction, but it is at once apparent that one operation at least is done away with—that of combining crankcase and cylinders. There is no intake manifolding, the carburetor simply bolting to an opening at the center of the casting below the exhaust manifold. The gases get to their respective cylinders through cored passages within the block. The cylinder head carries the water outlet connection, the spark plugs and the priming cups. A single cover plate goes over the valve tappet chamber. This in place, there is nothing exposed on the right side but the carburetor, exhaust manifold and magneto. On the left are the oil level gage, the water inlet connection and the generator.

Although the formula rating is 15.64 hp., the 5-in. stroke gives the engine a good displacement—153.4 cu. in. The developed power is 28 at 2000 to 2400 r.p.m., and the advertised power 20 to 25 hp. The pistons are light, as are the rods and their assembly. With a crankshaft 1 1/8 in. diameter, the light

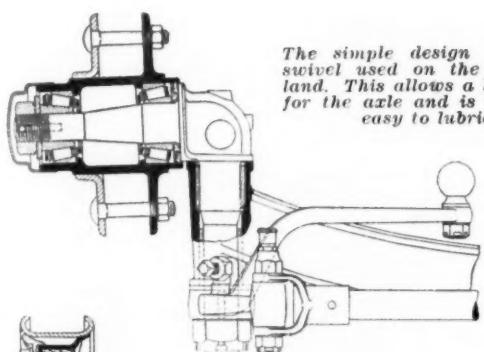
Features of New Overland

Motor.....	Four-cylinder Block
Bore and Stroke.....	3 1/8 by 5
Formula Horsepower.....	15.64
Maker's Rating.....	20-25
Electric System..	6-Volt Auto-Lite
Gearset.....	Three-Speed, on Axle
Wheelbase	104
Tires	31 by 4
Springs....	Cantilever rear, Semi-elliptic front
Touring Car.....	\$615
Roadster.....	\$595

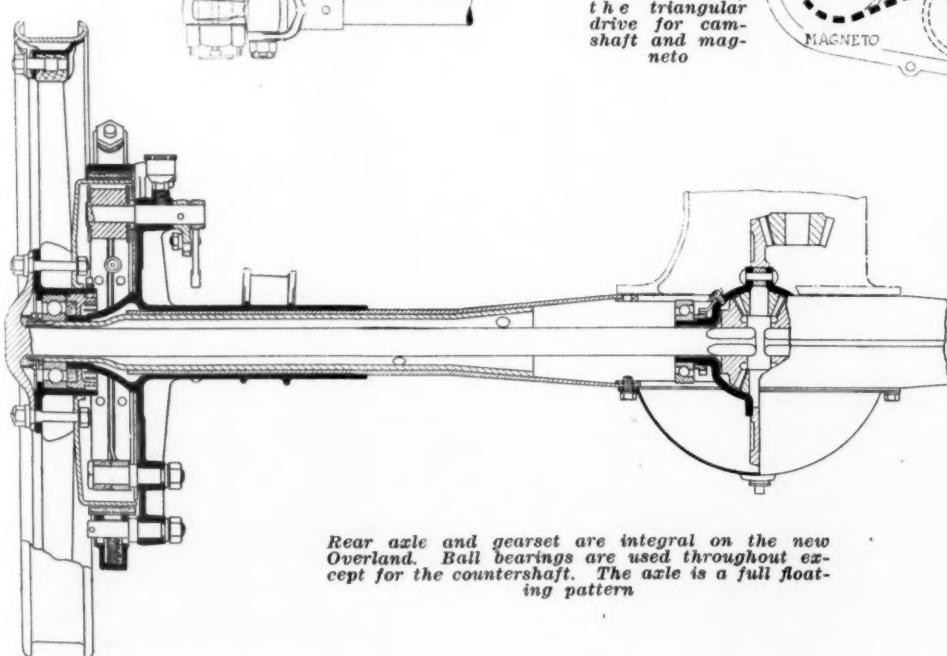
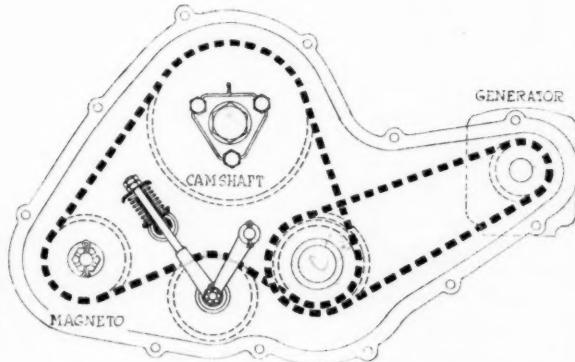
Motor of the new Overland. The two small diagrams on left show details of the original valve operating mechanism in which there are no push rods



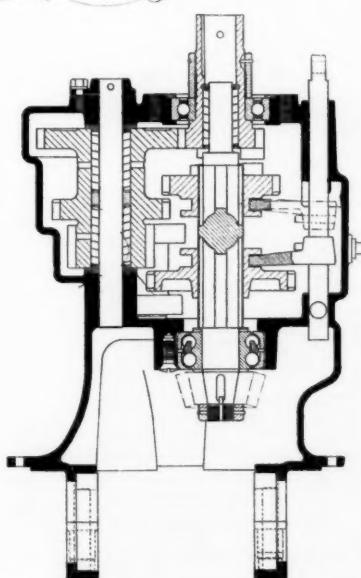
The simple design of steering swivel used on the new Overland. This allows a low position for the axle and is particularly easy to lubricate

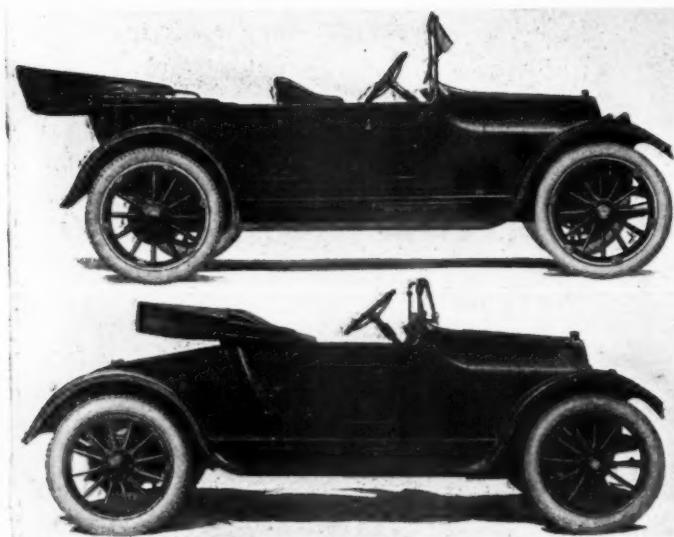


Chain layout, showing idler which maintains the tension of the triangular drive for cam-shaft and magneto



Rear axle and gearset are integral on the new Overland. Ball bearings are used throughout except for the countershaft. The axle is a full floating pattern





Above—Four-cylinder five-passenger Overland touring car which sells with complete equipment for \$615. Below—Roadster on same chassis which lists at \$595

reciprocating parts make high speed attainable with no effort and with a commendable lack of vibration. For instance, the piston and its rings weigh 1.9 lb., and the connecting-rod complete with bushing and cap comes to 1.5 lb. Thus a complete piston and rod assembly totals 3.4 lb., which is very light. The pistons are of cast iron, have the pins clamped in the rods and carry two concentric rings each.

Valves Are Large

Valves have a 1 9/16-in. clear opening and lift 5/16 in. The clear diameter is one-half the bore of the cylinders. One noteworthy feature of the valve assembly is the method of valve actuation, and the ease of adjustment. There are no tappets in the engine. Interposed between the valve stems and the cams are rockers pivoted on a rocker shaft just inside the valve compartment and readily accessible. The adjustment is on the lower end of the valve stem. A round-end nut screws to the end of each rod, and is held by a lock nut. This adjustment is usually on the tappet in designs where tappets are used. The rockers relieve the valve stems of any side thrust, and they also make the valve adjustment very simple. Should it be required to take the rockers from under the valve stems, it is but the work of a moment. They are free on the rocker shaft within sufficient range to allow them to clear the valve rods. Springs hold them against shoulders on the rocker shaft, and by pushing them along the rocker shaft against the spring pressure they are freed from the cams and valves. The whole rocker assembly bolts to the side of the cylinder casting so that it is immediately within reach when the cover plate housing it and the valves and springs is removed.

Two-Bearing Camshaft and Crankshaft

Both the camshaft and the crankshaft are carried on two bearings. The latter is assembled through an opening in the flywheel end of the crankcase, a plate here carrying the bearing and closing an opening that is large enough for the shaft to pass through. With a diameter of 1 1/8-in., the front bearing is 2 1/8 in. long and the rear 3 in. long. Connecting-rod bearings have the same diameter, and a length of 1 1/8 in. The camshaft front bearing is 1 1/8 by 2 1/8 in., and the rear 1 1/8 by 1 1/8.

At the center of the camshaft there is an extra cam which operates a plunger oil pump that keeps a constant level of oil in the individual splash troughs, drawing its supply from the oil reservoir in the base plate of the engine. A very legible float oil gage on the left side of the engine shows the amount

of lubricant. It rests on the top of the crankcase, bringing the indicator well up so that it is no trouble to read when the hood is raised. This gage housing also acts as the filler.

Roller Chain Camshaft Drive

Drive of the camshaft, magneto and generator is by chains, of which the inner one is a triangular drive with an idler to keep it tight. This chain runs over sprockets on the crankshaft, camshaft and magneto shaft. Outside of this is the chain that drives the generator from an outer crankshaft sprocket. The idler works against the outside of the chain, between crankshaft and magneto sprockets. A coil spring with a tension adjustment draws on the end of a small yoked member that carries the idler. The arms of the yoke pass around the chain and sprocket, making a good mounting. To still further strengthen the idler mounting and keep it in position, there is another member, pivoted at its upper end to the cylinder casting, and having an arm running to the sprocket center on either side. The scheme of this construction is brought out in the drawing of the front of the engine. There is means for taking up any slack in the generator chain at the generator end. The whole chain assembly is compactly housed, and due to the fact that the roller chains are not as wide as silent chains would be, this housing is not so thick as the latter would require it to be.

Two-Unit Electric System

Auto-Lite two-unit starting and lighting are incorporated. The drive of the generator and its position have already been touched upon. This unit runs at 2 1/5 engine speed. The starting motor, geared 11 to 1 to the teeth on the outer rim of the flywheel, is equipped with the Bendix automatic shift which has already been described in detail. In starting, all that is necessary is to press the starting button, when the spinning of the armature shaft sends the driving pinion into mesh with the flywheel, it disengaging automatically when the engine starts under its own power. This unit is carried on the right rear side of the engine close up to the flywheel as shown in the photographs.

Three-Point Suspension

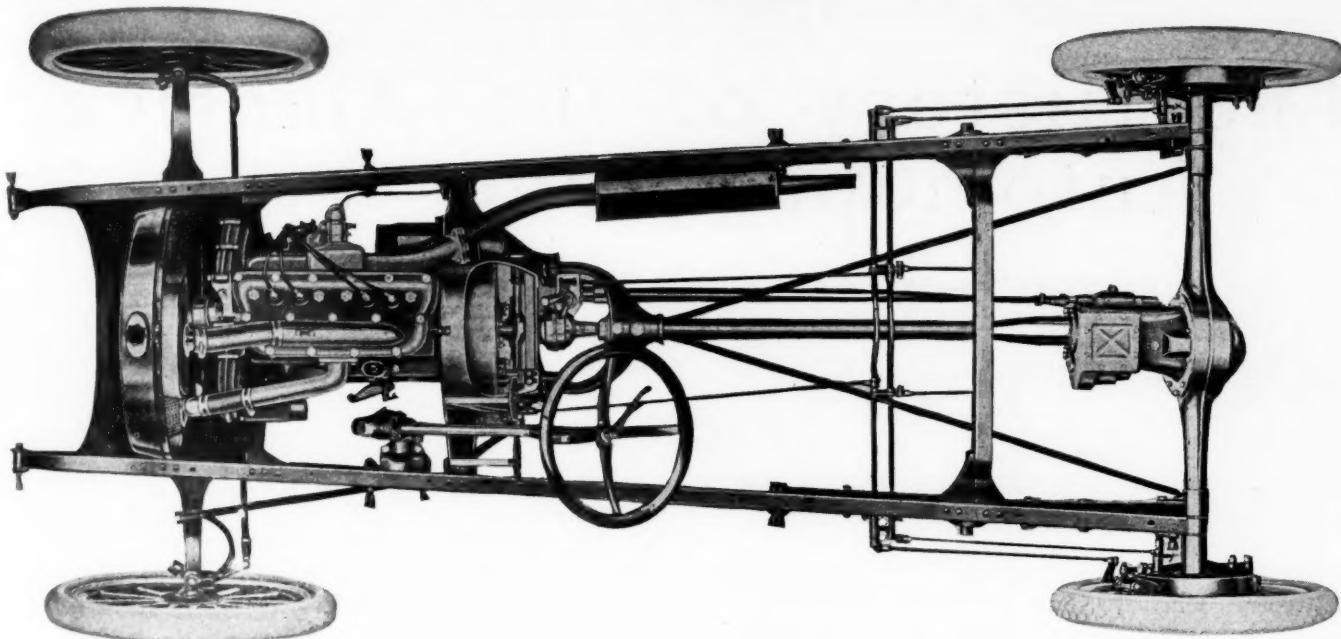
Three-point engine suspension is attained by resting the front on a frame cross arm, and bolting the rear of the motor to an arm construction that performs the functions of partially inclosing the flywheel, carrying the clutch throw-out rod, the pedal and gearshift controls and acts as the support of the ends of the yoke which is the termination of the torsion tube. This makes a nice assembly unit, the rear motor supporting arm feature being only one of its several parts.

Drive is characteristically Overland, with the hinged yoke carrying the front of the steel torsion tube, the rear end of which is flanged to the front of the gearbox. The clutch is leather-faced, on an aluminum cone with spring inserts under the leather and three engagement springs equally spaced. There is a small adjustable clutch brake with a fiber facing that acts against the clutch cone when disengaged, stopping it from spinning.

Compactness of design is notable in the gearset, which has one very interesting feature. The three countershaft gears



Cantilever rear spring used on the new Overland



Overland 75 chassis showing mounting of block motor and rear axle gearset. Note cantilever rear springs mounted under frame

are forged in one piece, the advantages of which from a manufacturing standpoint are readily apparent. This forging is made with a hollow center and there are two Hyatt roller bearings between it and a shaft which is fixed in the gearset housing. Thus instead of attaching three separate gears to a shaft and then allowing the shaft to revolve in bearings at either end, the shaft is stationary and the gears run around it. Fellows gear shapers make short work of the cutting of these gears.

The rear axle has a pressed-steel housing and there are no truss rods or other braces. The bottom and top of the housing are ribbed on the outside to take care of bracing, making a substantial construction. Ball bearings are used in the axle's internal construction, and the design is what is termed a one-bearing floating type. The entire weight of the car is borne by the housing, the axle shafts taking none of it. The axle shafts, which are squared into the differential, have driving flanges integrally forged and these bolt to the wheels. Thus the shafts can be withdrawn entirely without disturbing the wheels in any way. Ample provision is taken against oil leakage out of the axle by felt washers at proper points.

Front axle design is entirely new to Overland cars. It is of the type known as the inverted Lemoine construction, whereby the wheel spindles are suspended from the top of the steering knuckles instead of from a point between the arms of a yoke, as in the more conventional design. There is no yoke support for the knuckles, simply a single support on the end of the I beam. The design simplifies the forging and makes a nearly straight axle. It allows the car weight to be low in relation to the wheel bearings, assisting steering.

Cantilever Rear Springs

Mounted directly under the side members of the frame, the rear springs are full cantilevers, 42 in. long by 2 in. wide. They are trunnioned at the center, and shackled at front and rear. The rear support is below the axle housing, serving to bring the suspension low down, which is desirable. These springs have been so designed that they give exceedingly easy riding qualities to the car.

A straight taper from front to rear is given the frame. It is simple in form, there being a cross member at the front, and another three-quarters back. No cross piece is used at the rear, this not being needed in addition to the member just a little forward. This member, by the way, is located at the

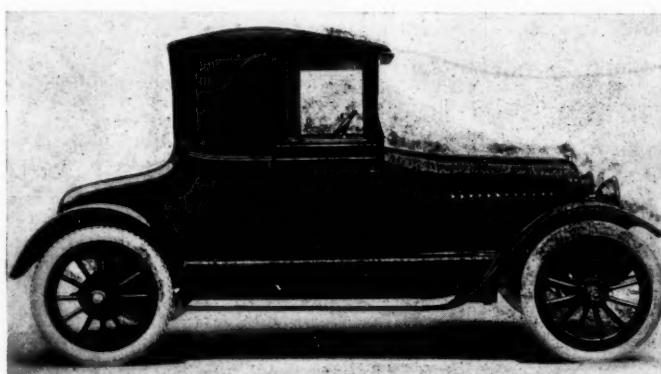
point where the cantilever springs attach to the frame, strengthening it where support is needed. The taper of the side rails is such that the body is given good support throughout its length.

Crowned fenders of sheet steel are fitted, these adding their part to the general appearance. The standard body finish is black, and the upholstery Fabrikoid. Equipment is very complete, taking in such items as demountable rims, one-man top, speedometer, electric horn, and all the little fitments that go to make up the finished car of to-day. The gasoline tank is in the cowl and the filler pipe on the dash.

New Grant Roadster and Cabriolet

The Grant Motor Co. has added to its line a new cabriolet at \$1,025 and a new roadster at \$795. Both new models are mounted on the standard six-cylinder chassis which remains unchanged except for the substitution of special roadster springs scientifically designed from the standpoint of roadster weight and three-passenger carrying capacity.

The cabriolet windows lower for ventilating and are equipped with anti-rattle devices and the windshield is also adjustable to a variety of positions. The back of the body opens up its full width, providing unusually large storage space with ample room for storing extra tire and demountable rim in addition to luggage, repair kits, tools, etc. Like the touring car, the new models are finished in dark Brewster green with black fenders, hood and running gear.



New Grant cabriolet which sells for \$1,025

The History of the American Automobile Industry—4

The Development of the Electric Vehicle from 1800 to 1880, Whence the Present Practical Era Dates—Steam Vehicle Progress from 1825 to 1870

By David Beecroft

Review—Last week the development of steam vehicles in America up to 1810 was told, at which time the advent of road building was at hand. A brief review of early road building was included, which review, intended to show why motor vehicle progress was held back in America by lack of roads, is continued in the opening paragraph this week, after which is resumed the progress in motor vehicles in America from 1825 on.

THOMAS TELFORD, England, 1757-1834, was one of the greatest civil engineers of his time. He built the road from Warsaw to Brest for the Austrian Government, and served on many canals, locks and bridges. In 1803 he was engineer for the construction of 920 miles in the Scottish highlands and later perfected communication between London and Scotland and the north English towns, as well as in the more inaccessible parts of Wales. The Telford construction is very similar to the Tresaguet, consisting of a foundation of large broken stones, carefully set, on which the finer broken stone is placed. The Telford system has been very little used in America excepting where the soil has been of such character that it would not support the broken stone without a foundation of heavier stones to assist.

First Street Cars, 1832

Reverting again to the progress of steam road vehicles in America, in 1825 T. W. Parker is said to have made a steam vehicle with three wheels that were 8 ft. in diameter. The motive power was a two-cylinder steam engine. It was only 7 years later, 1832, that John Stephenson built the first street cars ever to be used in America and started running them on the streets of New York City.

At this time the influence of development of other forms of motor vehicles was beginning to be noticed in America, an indication that steam was not going to have clear sailing so far as road vehicles were concerned.

Electricity Grows in Importance

It was at this time also that the influence of electricity was beginning to assert itself, so that as far back as 1840 we see the struggle among steam, internal combustion engine types and electric types starting an industrial warfare that raged with more or less energy until the opening years of the twentieth century, when the ascendancy of the internal-combustion type of vehicle had established

itself, when steam was on the wane and the electric type was in second position. The progress of steam vehicles must be set aside for the moment and a few paragraphs inserted on the activities of electricity and also efforts at patenting features of the explosion engine.

While Benjamin Franklin, in 1751, and Joseph Priestly, 10 years later, suggested firing guns by electricity and many minor electric phenomena were known, practical electricity dates to 1801, when Sir Humphrey Davy produced and studied the arc light in England. In 1802 Romagnosi, an Italian, discovered that the magnetic needle was deflected by the electric current. In 1831 the principal facts of electric induction were discovered by Sturgeon, Henry and Page, who followed Faraday's discovery of electric induction in 1831. S. F. B. Morse of New England conceived the electric telegraph in 1832 as he was returning from Europe and exhibited his apparatus in 1837. From this time a wave of electric progress was started which became evident in several countries.

An Electric Boat in 1837

W. Sturgeon, a British inventor, carried his electric experiments further and tested an electric boat in 1837, as did Prof. M. H. von Jacobi on the river Neva at St. Petersburg in 1839. Von Jacobi's motor was of about 2 horsepower driven by a Grove primary battery.

In 1840 Davenport & Cook of Vermont, United States, made an electric motor of the walking-beam type and drove a printing press with it. Their battery used zinc and copper plates and a blue vitriol solution.

A Scotchman, Robert Davidson, in 1842, ran a 5-ton electric locomotive at about 4 miles per hour, using as his source of current a primary battery of seventy-eight cells. The plates were 13 in. square, of zinc and iron, and a sulphuric acid solution was employed. Thus far it seems not to have occurred to anyone that two electromagnets could be combined and give better results than one used in conjunction with a permanent magnet, but in 1844 Dr. W. F. Channing, a Boston electrician, substituted an electromagnetic field for the permanent one commonly used. Two years later King and Starr produced electric light in a vacuum, but Starr died and the matter was dropped.

In 1847 Moses G. Farmer of Massachusetts exhibited a locomotive driven by forty-eight Grove cells of 1 pint capacity each. This little car ran on an 18-in. track and carried two people. Three years later Prof. Charles G. Page of Washington, D. C., used a 16-hp. motor driven by 100 Grove cells, having plates 1 ft. square. This vehicle carried twelve or more people at a time at 19 miles per hour on the W. & B. R.R. between Washington and Bladensburg.

With successes of this kind and an active interest on both sides of the water, it seems to us who are now familiar with electric traction very strange that the devices had to wait so long for public recognition and final success. It must be considered, however, that the wet or primary cells were both expensive and not well adapted for transportation work, and at that time they seemed still to lack suitable means of producing electric power, although the knowledge existed that running a motor by power would convert it into a dynamo and produce a current. Further, the gas engine had not yet been perfected, the steam engine was still very crude and uneconomical, water power was not available at most of the large cities, and even if the electric dynamos had been efficient, the storage battery did not exist and trolley wires were unheard of in their present form. True it is that Henry Pinkus, in 1848, took out a British patent on a sort of third rail so that the car could be driven without carrying its own battery. Lilly & Colton, of Pittsburgh, Pa., in 1847 invented a means of controlling the electric car from the battery station, the current traveling to the car on one rail and back on the other, a method that has not proved very successful."

A Lull in Activity

For the next 30 years electricity made little progress. The telephone was conceived in 1861, but it was over 10 years before its practical life was started under William Graham Bell. In 1879 the practical incandescent light was produced. The first electric railroad was run in Germany in 1881. In 1884 Cleveland, Ohio, was the first American city to have an electric street car system in competition with horse cars; and in 1895 the first electric locomotive was used in America in the tunnel under the city of Baltimore. This brings us up to the time when the practical electric automobile, as we know it to-day, was a reality.

Hot-Tube Ignition Appears

Reverting to 1837 and looking at the progress made in other fields of transportation in America we find that Dr. Alfred Drake, an American whose work extended from 1837 to 1855, brought out what is now known as hot-tube ignition, which in later years found very extended use. Drake's tubes differed from the later forms in that they extended into the mixture in the cylinder and were heated by a flame blown into their open outer ends.

In 1844 Stuart Perry of New York took out United States patent No. 3597, embodying a considerable number of valuable features. He employed liquid fuel and mentions several kinds, but

seems to have conducted his experiments with turpentine. His carburetor, called by him a generator, employed heat to convert the turpentine into a vapor which he mixed with about fifty parts of air. He employed compression, flame ignition, air cooling and provided a clutch so that his engine could be started before being connected with the work. Another patent taken out in 1846 shows some improvements and water cooling.

Progress of Steam Vehicles

Resuming again the progress of steam vehicles: The development of steam from 1825 on was very slow in America, it not experiencing the stimulation it received from improved roads in England, so that up to 1860—Civil War days—there is little to record more than sporadic efforts.

In 1835 a machinist in Brattleboro, Vt., built a steam road vehicle that was successfully used on the roads. It resembled an ordinary one-horse wagon and the boiler was made of U-shaped tubes about 1 1/4 or 1 1/2 in. in diameter, so placed that the lower ends of these tubes served as a grate, while the flame followed them toward the top, the other ends forming an arch or cover to the firebox. These tubes were connected at top and bottom ends by larger tubes or drums and a second drum above the top one served as a steam dome, these drums being about 4 to 6 in. in diameter with the top one somewhat larger. Two cylinders were used, the pistons being about 3 in. in diameter. This was one of the many experiments that were constantly being tried, but which we necessarily omit because they were not known or sufficiently important to be worthy of mention.

A Two-Cylinder Engine

In 1840 J. K. Fisher of New York designed a small steam car, but his British engineer friends advised against it because of the difficulties that had been encountered in England. Later on he took up the work and in 1853 built a vehicle having a two-cylinder engine, 4 in. bore by 10 in. stroke, and developing 15 hp. This vehicle used 5-ft. wheels. Between 1859 and 1861 he made several engines and took many trips with his vehicles.

In 1857 Richard Dudgeon, of Coney Island, built a steam car having two cylinders 3 by 16 in. and capable of running 10 miles per hour on gravel roads. This was exhibited at the New York Crystal Palace and was destroyed there by fire in 1858. Some years later, 1867, he built another, which is still in existence, and has been used frequently in recent years by one of his sons residing at Locust Valley, L. I.

Armored Cars Not New

The Civil War of 1861-5 called the attention of inventors to the self-propelled vehicle for war purposes and *The Scientific American* speaks of steel-clad steam chariots of war which should consist of road locomotives covered with plates and having a rifled cannon mounted on a pivot and protected by a shield platform. Thus it is seen that the armored war-car thought is more than a half century old and probably very much older than that.



The Rostrum

Enlarging Condenser Does Not Affect Spark

EDITOR THE AUTOMOBILE:—Would increasing the size of a condenser increase the intensity, or distance a spark would jump using a given coil and battery? Does the distance that a spark will jump depend upon the magnetic capacity of the core, the ratio of the ampere turns in the two windings, the difference in size of the primary and secondary wire or what?

2—What is the compression in pounds to the square inch in cylinders of modern, well-designed automobile engines?

3—With what type of generator is it necessary to short circuit the field windings to keep them from burning out when the storage battery is disconnected?

4—Is there any automatic device which makes short-circuiting unnecessary, used in any of the systems now on the market?

Ancon, C. Z.

E. ALLEN.

—The increase in the size of a condenser over the requirements of a coil would not increase the strength or size of the spark.

2—Anywhere between 40 and 70 lb. per sq. in. absolute.

3—This depends solely upon individual design.

4—Some of the systems, such as the Bosch, are protected by means of a fuse in the field circuit so that if the battery is disconnected and the removal of the fuse is neglected it will automatically blow and protect the instrument.

Burning Paint Requires Care and Skill

Editor THE AUTOMOBILE:—Would you advise burning off present paint on car in order to have change of color from deep navy to grey without varnish? Could finish be kept clean easier without varnish?

Needham, Mass.

F. T. R.

—If you have not had any experience in burning off paint do not risk a good car in order to learn how to do it. If you are skillful with the use of the torch, burning is the most thorough way to remove the paint.

Regarding which finish is easier to keep clean, it is just as easy to keep an unvarnished surface clean as a varnished one. The only difference is that a varnished surface has a polished effect, whereas the unvarnished is dull and not so delicate.

Circuits of U-S-L Electric System

Editor THE AUTOMOBILE:—Kindly explain by sketch and description the charging and starting circuits of the U-S-L starting and lighting system?

2—What is the way to find a missing cylinder in an eight or twelve-cylinder motor?

New York City.

T. D.

—The two illustrations herewith, Figs. 1 and 2, show a wiring diagram of this system. On Fig. 1 the arrows show the direction of the current flow in all of the circuits when starting and Fig. 2 shows the direction of all the circuits when the car is traveling normally. These marked diagrams should provide you with the information you desire.

The starting switch performs no function when generat-

ing. When starting, the plunger, which is represented in the diagram by a bar, connects the three terminals of the starting switch together.

The automatic switch is of the ordinary type which closes the battery charging circuit when the voltage of the generator is sufficient to charge the battery and opens it when the voltage falls below that required to charge the battery.

The touring switch is convenient in stopping the battery charge for long daylight drives when practically no current is being consumed.

2—The best method is by short-circuiting the plugs in each of the cylinders individually while the motor is running slowly. When a difference is detected as soon as the plug is short-circuited it is evident that the motor was previously firing on that cylinder.

Removing Axle Shafts from Olds

Editor THE AUTOMOBILE:—Will you kindly advise me as to the best method of removing the rear axles from the housing on my model A Oldsmobile roadster?

Can these axles be straightened so as to take the play out of wheels?

Can you give me the makes of rims used on these wheels? Youngstown, Ohio.

F. D. J.

—In order to remove the rear axle shafts from the rear axle housing it is first necessary to take off the rear wheels. After this is done there will be found a small lock-nut held to the end of the axle casing by a cap screw to prevent the bearing cup from turning around after it has been properly adjusted to the bearing which runs in same.

The above lock holds in place a

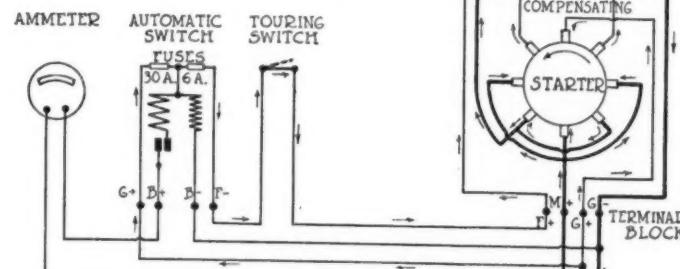
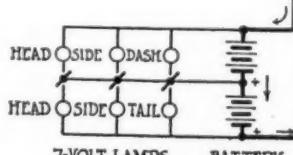
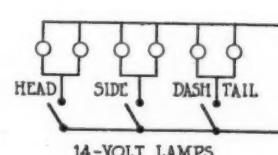


Fig. 1—Wiring diagram of the U-S-L electric starting and lighting system, the arrows indicating the direction of the current flow in all of the circuits when starting.



bearing cup which screws in the end of the axle casing. This cup is threaded with right hand threads and can be removed by the use of a wrench designed for this purpose or by using a small punch and tapping lightly with a hammer until it loosens sufficiently so that it can be turned out the rest of the way by hand.

After this cup has been taken out the bearing can be removed and the axle shafts pulled out.

In regard to straightening bent axle shafts it has been found that once one of these shafts has been bent it will not hold for any length of time. The trouble mentioned in your letter is undoubtedly due to worn out hubs on the rear wheels. It is also possible that the outer ends of the axle shafts are worn. In very few cases has the trouble been found to come from bent shafts. The remedy is generally the use of steel shims unless you desire to replace the parts.

It is impossible to advise exactly the style of rim used on this particular car since at different times the Goodrich, Marsh, Goodyear, Fisk and clincher types were employed. This information can be secured by supplying the number of the car or motor.

Speed Engaged with Lever in Neutral

Editor THE AUTOMOBILE:—We have a 1911 model Brush which has been giving us considerable trouble during the past year and will try to describe this. It seems to have developed during the summer of 1914. The owner could not crank the car as it seemed to be in gear, although the lever was in neutral position. We took the car all down and found the drive gear on the end of the driveshaft had slipped out of place about $\frac{1}{4}$ in. We cleaned the transmission very carefully, putting the gear back into place. The car ran well again for some time, when the same trouble came back. The car was again taken down and the gear was found to be in the proper place and we could not find anything wrong so we cleaned the transmission and reassembled the car again. The car ran well all last season, and up to about June 1 of this year, when the same trouble returned. The gears were all right and everything seemed to be in place. After cleaning the car it ran all right for a time, but since then have had the same trouble return sev-

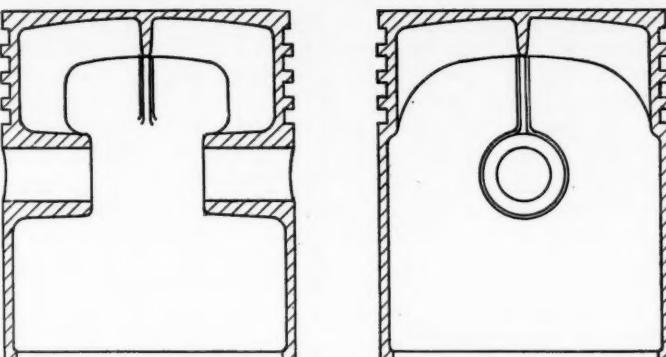


Fig. 3—Illustrating the system of ribbing piston for preventing excessive expansion by dissipating the heat

eral times. What do you think may be the cause for this? Spooner, Wis.

G. W. H.

The trouble you are having is probably that one of the speeds is still engaged while the lever is in neutral. The gearset used on the Brush car is a planetary design using disks in all speeds and no doubt if you will equalize the hand control lever so that it will go the same distance into low speed from neutral position as it does into the reverse, it will overcome the trouble.

It can also be caused from not using the proper oil or grease which would allow the gears to become gummed or sticky. It is therefore suggested that you thoroughly clean out the gearbox with gasoline or kerosene, drain it and then add a new supply of non-fluid oil.

Aluminum Alloy Pistons for Racing

Editor THE AUTOMOBILE:—Would you advise using aluminum alloy pistons in a racing car using a Buick 17 motor? We now use cast-iron pistons of about 3 lb. and connecting-rods of the same weight.

2—Also, what clearance would you allow for expansion in this motor for races of not over 25 or 30 miles and also have it so that you could run about the city at about 15 on high?

3—Please give us a diagram as to the construction of the pistons on the inside so as to not allow too much expansion.

Saginaw, Mich.

B. G. & S. Co.

—Yes, to attain the highest possible speed.

2—For a racing job if the motor is going to be driven at a very high speed, that is, above 60 m.p.h., even for short distances, it would be advisable to allow possibly 0.0035 per inch of piston diameter on the skirt. Possibly as much as 0.005 per inch for at least the first land, tapering back with less clearances on the succeeding one.

3—The best means of keeping the piston expansion down by dissipating the heat would be to put deep ribs across the head. One rib from boss to boss and a transverse rib. The illustration herewith, Fig. 3, will explain what is meant by this.

Probably a Break in Regulator Winding

Editor THE AUTOMOBILE:—On my 1913 Cadillac I have recently experienced a little trouble with my Delco system which baffles me and I would be pleased to have your advice. My storage batteries are in A1 condition, having recently been recharged owing to the cause explained herein.

On pressing the starter switch button on the switch box the current is so weak that the coil in the magneto latch fails to draw the pawl down so that the arm on clutch pedal shaft cannot hook onto the pawl and operate the electric generator switch. On engaging the latch with my finger, however, the batteries will turn over the electric motor (and

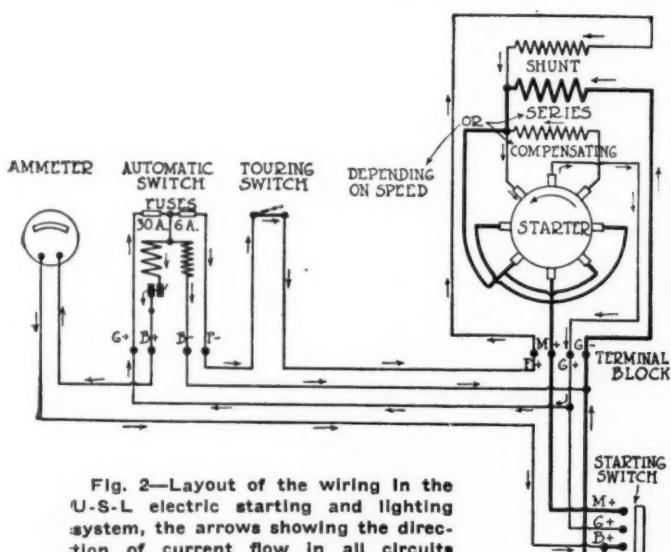
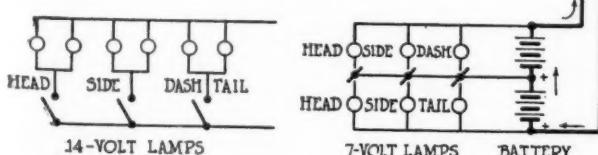


Fig. 2—Layout of the wiring in the U-S-L electric starting and lighting system, the arrows showing the direction of current flow in all circuits when the car is travelling normally



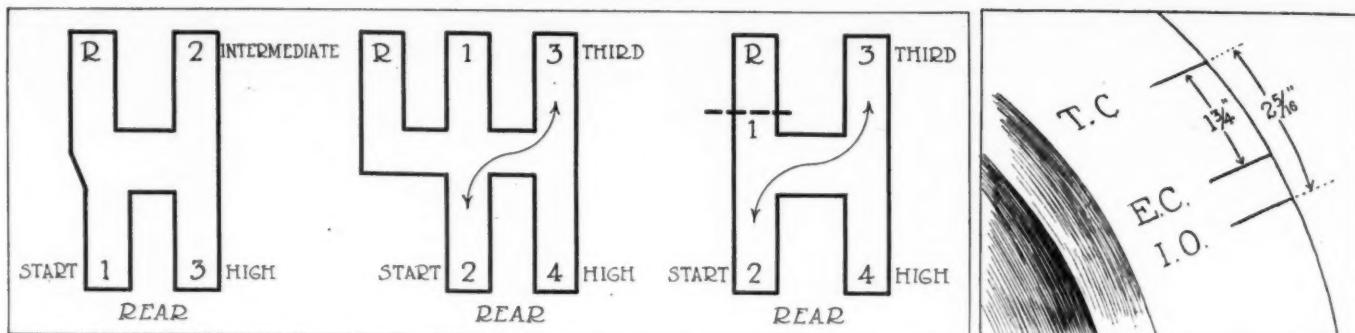


Fig. 4—left—Illustrating the recommended practice in gearshift gates adopted by the Society of Automobile Engineers. Fig. 5—right—Timing of model 19 Buick by the flywheel face

in turn, of course, the engine) at a high rate, thus proving that the batteries are all right.

But yet when pressing the switch button on top of switch box, the electric motor fails to rotate at all to allow the pinion to mesh with the teeth on flywheel.

The band of the ammeter stands at zero whether engine is running or all lights burning and of course, therefore, neither shows charging or discharging. The engine also misses badly at all speeds and carburetor is all right and distributor, battery and magneto, are in good order and clean. Any suggestions you can offer to help me out will be greatly appreciated.

Branford, Ont.

R. T. L.

—While the details you give are not sufficient to render positive the diagnosis of your trouble it seems that the difficulty is that when the starting button is pressed the armature on the motor generator does not revolve so as to permit the clutch pedal to be depressed for meshing the starting gear. The winding of the magnetic latch coil is in series with the starting button and also with the small commutator for generator winding. Across this circuit is connected the shunt field which is the field having the fine winding and this shunt field is in series with a fine winding on the voltage regulator. All this will be readily made clear by noting the wiring diagram which is provided in your 1913 Cadillac instruction book.

When the starting button is depressed the circuit through the winding on the magnetic latch coil and the generator winding is completed and hence the armature rotates, making it possible when the clutch pedal is depressed to mesh the starting gears. Sometimes, however, the small winding on the voltage regulator will break, causing an open circuit in the shunt field. Under these conditions, the generator will not revolve when the starting button is depressed and it is therefore suggested that a new voltage regulator tube be tried in this case.

If the fine winding on the voltage regulator is open, as stated, the matter may be known by connecting the center terminal of the voltage regulator with the left terminal of the voltage regulator. This will short out the fine winding and close the shunt field circuit provided the fine winding on the voltage regulator is open. The car, however, should not be run in this condition but the voltage regulator should be repaired as promptly as possible. Otherwise damage is likely to result to the batteries.

Recommended Practice for Gear Gates

Editor THE AUTOMOBILE:—I wish to call your attention to an article about the late meeting in Detroit of the Safety First Federation published in THE AUTOMOBILE for Oct. 28, page 810. In the right hand column, under the caption, Standard Gearshift Gates, you say: "The successive positions through which the gear-shifting lever has to go in progressing from one speed to another have been standard-

ized by the society and are closely followed by the majority of cars using selective transmissions." Can you inform me as to what this standard is?

I am a car driver of many years' experience; have owned a number of cars and fully realize the danger and difficulty referred to in said article. I have often talked about it and have taken it into consideration in the purchase of cars. At present I am the owner of two cars, each having the system used by the Cadillac, Overland, Studebaker, Regal and others. This seems to me to be the best and most natural position where the gearset is situated at the right hand of the driver.

Washington, D. C.

H. E. S.

—The recommended practices adopted by the Society of Automobile Engineers are those shown in Fig. 4.

Buick Timing in Flywheel Travel

Editor THE AUTOMOBILE:—In reading the Rostrum of THE AUTOMOBILE for Sept. 30, I notice that you gave the valve timing of a model 19 Buick for "F. S." of Barberton, Ohio. In your drawing you state that the exhaust valve closes 1/16 in. past top center and the inlet opens 3/32 in. past top center, which is correct in piston travel, but not on the flywheel circumference. As a model 19 has no starter the gear teeth on the drawing might confuse the questioner as his flywheel has none. Below is the correct timing by the flywheel face, Fig. 5.

Newark, N. J.

W. C.

Uncertain as to Carburetor Type

Editor THE AUTOMOBILE:—I have a 1907 Pierce-Arrow 28-32 hp. and no one seems to be able to adjust the carburetor correctly. It is of the automatic type and has baffled experts.

2—Is there any way to shift gears silently with the Pierce-Arrow interconnecting device, progressive type?

3—Why is it that the car will run all right on the level, pick up quickly and as soon as it is throttled down to about 15 m.p.h. on every five or six revolutions it begins to miss?

The plugs are all new, valves are ground, etc. Also, on a small hill it seems as though something is holding it back. It simply will not take hills on high.

E. Williston, L. I.

M. Z.

—In the year you mention the Pierce company used a carburetor in which the auxiliary air valve was a poppet design held on its seat by a coil spring. The left of the valve was entirely regulated by the weight of the spring and the suction of the motor. In the following year or late in the season this auxiliary air valve was changed to a reed valve design and it is not certain whether the carburetor on your car has the poppet or reed type. In either case it is possible that the throttle valve is worn considerably or that the adjusting needle is scored in the spray nozzle, also perhaps the

intake manifold is leaking through its various joints due to gaskets not being tight or the joints broken from their fastenings.

2—Regarding the shifting of gears the progressive type of gearset was used in that year, the shifting lever being a quadrant directly under the steering wheel. If the gearset is in perfect condition and there is no excessive play between the shifting lever and its various connections to the transmission gear and the car is not accelerated to excessive speeds, the gearshift should be performed quietly for that type of transmission. Of course it must be understood that the standards of quietness in 1907 were not what they are in 1915.

3—This may be either due to carburetor, weak valve springs or ignition. It is impossible to go into any of your questions thoroughly without more data as you do not say anything regarding the condition of the motor and its accessories such as the valves, magneto, etc.

Open Circuit in Armature Winding

Editor THE AUTOMOBILE:—Can you tell me what can be the trouble with my Auto-Lite single-wire system generator? It will not produce current but will run as a motor when the current is applied to it. Everything seems to be all right. What is the cause for the solder melting where the wires are fastened to the commutator?

2—Please explain the relay as used on the first self-starting Cadillac. This one will vibrate, but will not allow the current to pass through.

Clay Center, Kan.

—The trouble seems to be an open circuit in the armature. That is, one of the connections to the commutator may be loose or broken. The cause of melting of the solder where the wires are soldered to the commutator is impossible to determine without having an opportunity to examine the generator and this should be referred to an experienced electrician.

2—From the quotation which you give, it may be gathered from the words, "first self-starting Cadillac" that this is a 1912 car, as this was the first model on which a starter was placed. There were, however, on this car, two relays—one ignition relay in the dry cell system and one cut-out relay in the generating system, between the generator and the battery. It would therefore, be necessary to know which of these relays you have reference to in order to intelligently answer this inquiry.

Bosch Duplex Ignition System Explained

Editor THE AUTOMOBILE:—Please explain and give full details of the Bosch duplex ignition system.

Lincoln, Neb.

—The Bosch duplex magneto differs from the independent magneto in that it is fitted with a commutator and in its application requires the use of a small primary coil which is combined with the switch. Aside from these changes the magneto is identical with the independent type which has frequently been described in these columns.

The Bosch duplex coil, which is used in connection with this system, consists of a stationary cylindrical housing containing a single primary coil and in addition a switch assembly. In the coil itself there is an iron core which carries a movable switch plate with both ends of the wire winding connected to metal segment on the switch plate which may be brought into contact with the springs on the connection plate.

With this system the battery aids the magneto at low speeds, the battery current being thrown into phase with the magneto current and thereby assists in producing sparks at low piston speed.

The system above described is the old non-vibrating type. In addition there is the Bosch vibrating duplex ignition,

which is a different arrangement. The entire system, aside from the independent Bosch magneto consists only of a low-tension coil, a switch and a battery; these, with the exception of the battery, are furnished by the Bosch Magneto Co. in making up this outfit. The coil is the only part which is special. The method in which this system operates is by effecting an arrangement whereby the magneto circuit is absolutely independent and complete in itself, the battery circuit including both coil and magneto as illustrated.

With the switch in the battery position, the battery and coil are in series with the primary winding of the magneto, thus there is induced in the secondary winding of the magneto armature a very powerful sparking current which, on account of the vibration of the coil appears not as a single spark but as a series of sparks. The current so produced is distributed in the usual manner by a regular distributor. The battery side is not intended to be used separately, but merely as an auxiliary to the magneto for starting. For regular running the magneto operates independently.

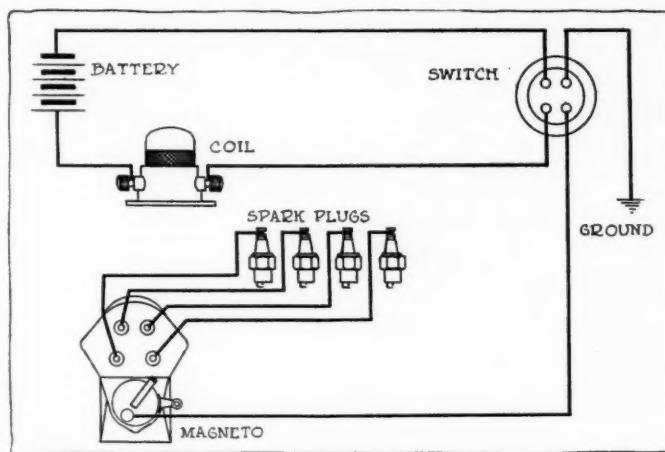


Fig. 6—Diagram of Bosch Duplex System with non-grounded battery

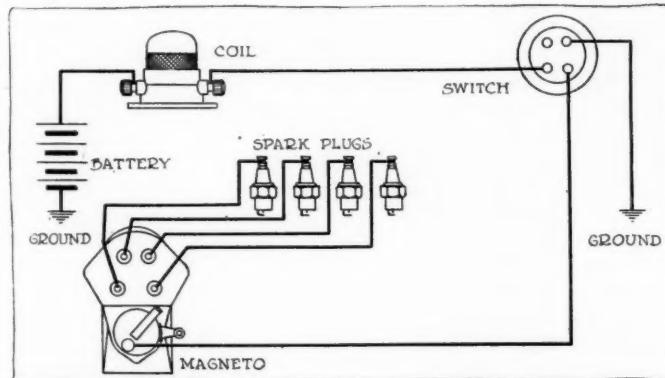


Fig. 7—Diagram of Bosch duplex system with grounded battery

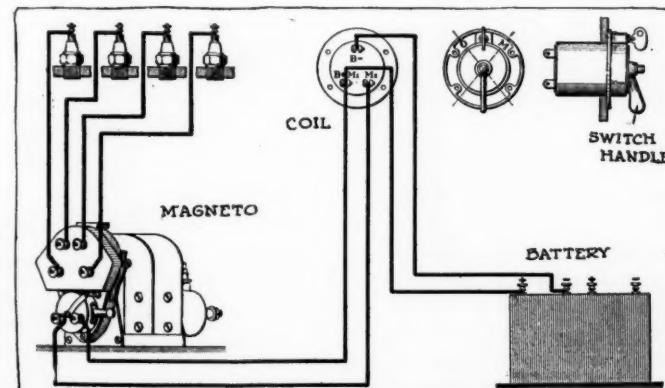


Fig. 8—Obsolete type of Bosch duplex system

ACCESSORIES

Mac Kno-Glare Bulb

THE base used in the Mac Kno-Glare swivel bulb is the same size as the standard Ediswan base and will fit into any Ediswan socket of any make but the pins which hold the lamp in the socket are mounted on a separate ring fitting into a recessed portion of the lamp base. When locked in the socket the bulb may then be rotated to bring the portion of the bulb which has been treated with a semi-translucent compound to the bottom part of the reflector, it being unnecessary to change the socket position. When the current is turned on, the clear portion of the lamp bulb, being at the top part of the reflector, permits the light rays from the filament to strike the upper portion of the reflector which deflects them in an intensified form upon the roadway, while the treated portion of the bulb does away with the glaring rays and softens the light. These bulbs are made in all candlepowers and voltages in both single and double contact for all makes of cars.—A. Hall Berry, New York City.

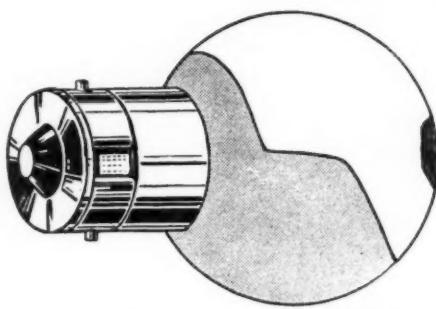
Defiance Welding Products

The Boko bucket is of canvas with a hoop rim and handle; it folds against the rim, lying flat. A tube leading from the bottom folds up against the side when not in use as a funnel. Capacity 2 gal. The makers state that they guarantee it to hold gasoline without leaking. The bucket lists at \$1.25.

The makers of the Boko bucket also manufacture a folding steel-framed camp stool which, opened, measures 15 in. high and folds flat into a space 7½ by 10. The seat is of 10-oz. army duck and the weight 2 lbs. The stool sells for 75 cents each.—Defiance Welding Co., Defiance, Ohio.

Singer Direction Signals

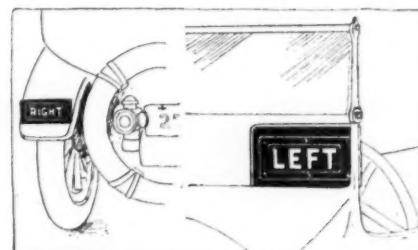
A signal which shows simultaneously on both the front and rear end of the car any proposed change in the direction or speed of travel is the latest in warning devices. By simply pressing an electric push button attached to the steering post or wheel these signs bear the words Right, Left, Circle, Stop or Slow. The signs are all operated by the one push button. The arrangement is so made that a single push of the thumb gives any desired signal, illuminates it if at night, and sounds the electric warning signal or bell, thereby making it of use for ladies driving electric or closed cars.



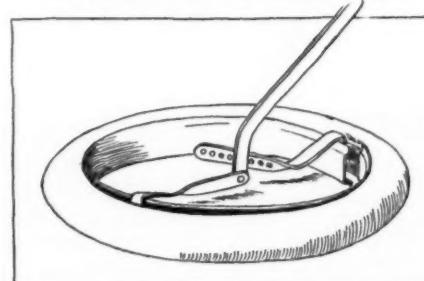
Mac Kno-Glare swivel bulb, showing base



Boko folding bucket, showing method of using



Singer signal system, front and rear



Federal handy tool for split rims

The signals are inclosed in a small black enamel box, 8 by 6 in., and the letters are 1½ in. high, a pure white on a black background. The manufacturers state that the letters can be read 150 ft. away. The signals are electrically operated and can be installed, according to the maker, in 15 min. The price has not yet been announced.—C. A. Singer, St. Louis, Mo.

Federal Handy Tire Tool

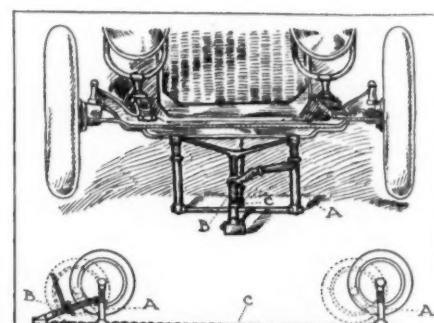
The Federal is a special tool for removing and replacing split demountable rims, and has ample leverage for doing the work without difficulty. The method of using it is clearly shown in the illustration. The tool folds into a small compass for stowing in the tool box. Price \$2.—Federal Sales Co., South Bend, Ind.

Waco Portable Garages

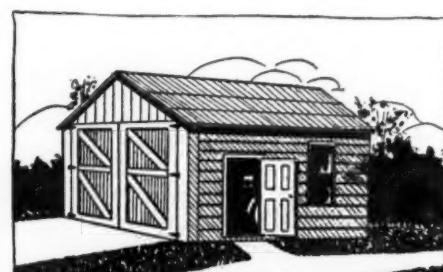
Waco garages are made in a number of styles and sizes, that illustrated here-with being suitable for any medium-sized car. The structure is 9 by 16 ft. of Georgia pine or steel sheeting with felt, rubberoid or imitation gravel roofing. The various parts are interchangeable as to position so that windows and doors may be arranged wherever desired. The standard outfit includes one double door, one single door and a window. Flooring is not furnished at the list price, which is \$65 for the garage illustrated, but may be obtained at the rate of 10 cents per sq. ft. for cement, or 3 cents for wood. Other sizes range from the Ford type selling for \$55 to a 16 by 18-ft. building for \$120.—Wabash Automobile Co., Chicago, Ill.

Reading Four-Wheel Jack

This is a jack which permits the simultaneous jacking up of all four



Reading four-wheel car jack



Waco medium sized portable garage

wheels of a car. It consists of a pair of steel frames *A*, one for the front and the other for the rear axle; each frame carries two adjustable heads to pick up the axle. The frames are connected together by a heavy steel chain *C*, and one of the frames is connected with a screw jack *B* by a short chain. The car is run over the jack, the heads placed in position against the axles and the screw operated, which raises the whole car and holds it steadily with all wheels free and clear. The length of the chain and the height of the lifting heads are adjusted to suit the car on which the jack is used. The makers state that it is perfectly safe to run the motor and do any other work on the car with the jack under it. The weight of the jack is 65 lb. and the safe load is given as 6000 lb. Price, \$20.—Reading Automobile Co., Reading, Pa.

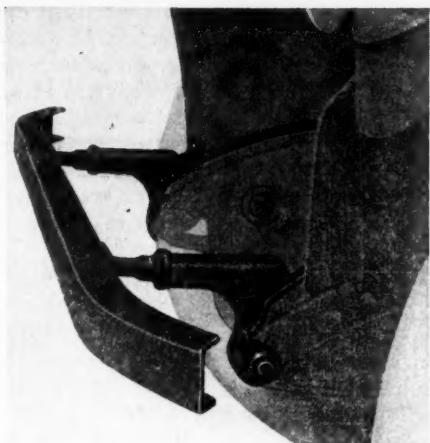
Cox Bumper for Cadillacs

A new Cox bumper has been put on the market especially for the 1916 Cadillac. This car differs from other models and makes in several ways and requires a special type bumper. As shown in the illustration, the bumper is attached by brackets which go over the spring horns and no additional holes need be drilled. The two bolts which hold the splasher and mudguard to the frame are replaced by two longer ones supplied by the manufacturers of the bumper. These bolts anchor the frame, mudguard, splasher and bracket securely. Where the bracket goes over the nose of the frame it is held by a special lock-nut which fastens on the regular shackle bolt which is supplied.

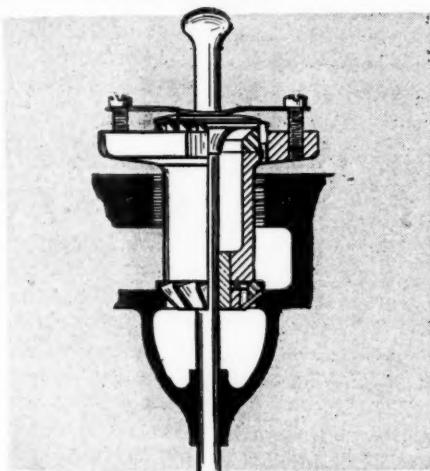
The bumpers are made in channel, diamond and round shapes. Each type is furnished in either nickel or black and the retail prices range from \$6.50 to \$10.—Cox Brass Mfg. Co., Albany, N. Y.

Hughes-Bull Valve Tool

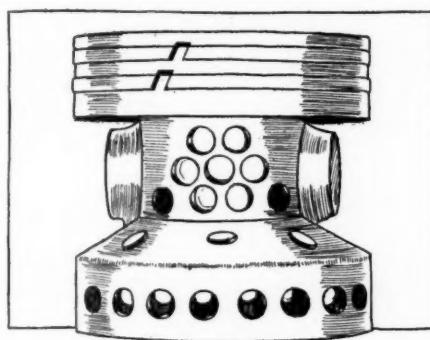
This tool trues both valve and seat in one operation, being of the milling cutter type and double, the seating tool being at the lower end and the cutter for



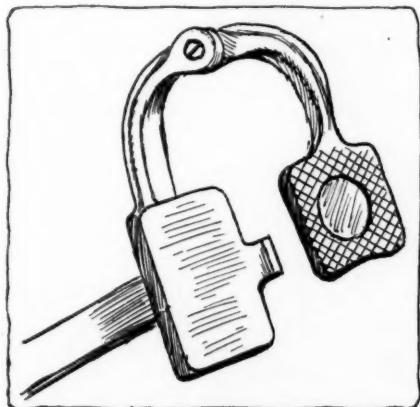
Cox special bumper for Cadillacs



Hughes-Bull valve-and-seat finishing tool



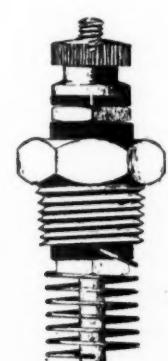
Zephyr extreme light-weight piston drilled for oil drainage and weight reduction



Two-step extension pedal



Lunkenheimer primer



Electro fuel vaporizer

the valve itself in its upper part. In operating it the tool is placed in the valve chamber, the lower cutter resting on the valve seat, the valve is then put in with the stem extending through the tool and down into the valve guide. The truing operation is effected by turning the tool by the driver at the top. The standard set sells for \$5.50 and the Ford size for \$5.—Hughes, Bull Co., Engineers, Detroit, Mich.

Zephyr Pistons

These pistons which are of the hour-glass type are extremely light, the rings being in the upper part and the wristpin bosses in the center which is smaller in diameter than at the top and bottom. The central and lower parts are drilled for lightness and to promote lubrication.—Wridgway Co., Wilkes-Barre, Pa.

Two-Step Extension Pedals

In order to provide two pedal lengths for cars which are driven at times by people of one leg length and at other times by people of another length of leg, the two-step extension pedals have been brought out. As shown by the illustration, which is the type specially designed for Ford cars, both pedals are always in place and either can be employed. The Ford set sells for \$2 per pedal fully nickel-plated.—Van Derbeck-Sayers-Murdock Co., New York City.

Lunkenheimer Primer

This primer occupies but little space, measuring $\frac{5}{8}$ in. in diameter and $2\frac{3}{8}$ in. in length, its operation is simple and convenient and it is compact and neat in appearance. The material used is a high-grade bronze which will not deteriorate under the chemical action of gasoline and the primer is quickly and easily attached. All necessary connections, such as tubing and unions, are furnished.—Lunkenheimer Co., Cincinnati, Ohio.

Electro Gas Vaporizer

In the Electro Gas Vaporizer a coil of resistance metal is screwed into the cylinder and is heated by an electric current, vaporizing the cold fuel with the object of making starting easy, especially in cold weather. A simple switch turns the current on and off. Current may be supplied from the starting battery or from a set of dry cells. Price \$2.—Suburban Lighting & Gas Engine Co., Toledo, Ohio.

Blake Tube Flux

The makers state that the Blake flux for soldering is non-corrosive, and, when used for electrical work, has insulating qualities. It is put up in 2-oz. tubes with long aluminum spouts, so that the flux can be squeezed out on the work without danger of melting the spout. It sells for 20 cents per tube.—Blake Signal & Mfg. Co., Boston, Mass.

Angular Venturi in Edwards

New Carbureter Employs Compensating Dashpot—Combination Weather Adjustment and Starting Lever

THE Edwards carbureter which made its débüt in an economy run in Chicago recently, in which it made a record of 28.9 miles per gallon with a model D-45 Buick six carrying four people, as described in THE AUTOMOBILE recently, is manufactured by the National Carbureter Co., Chicago, Ill. While the showing of economy made on this test was an enviable one and the fact that the car developed a speed of 58 m.p.h. on a short stretch of country road without changing the adjustment of the carbureter is evidence that the mixture was not kept too lean, the new design of carbureter has other features which make it interesting.

Jet Enters Venturi at an Angle

This carbureter, which is the design of W. A. Edwards, is of the single-jet type in which the jet enters the venturi at an angle, as shown in the illustration. The use of the venturi is to increase the speed of flow. Increased acceleration is obtained by use of a piston operated by the air valve *A* which forces the fuel into the air stream around the needle valve. It is to this feature in part that the acceleration, of from standing start to 25 m.p.h. in 11 1/5 sec. through the gears and on high gear from 5 to 25 m.p.h. in 11 4/5 sec., on the recent Buick test may be credited.

In addition, there is a combination of weather adjustment and starting lever whose first movement regulates the vacuum in the instrument and the final movement seals the air valve to give a very rich starting mixture. To prevent the incoming air from blowing the gas coming from the venturi *V* across to one side of the manifold, the casting is made in a U-shape to provide a baffling wall *BW*, which directs the air upward over the mouth of the venturi. Any condensation is taken care of by a drain *H* which taps the mixing chamber and leads the liquid back into the venturi. This prevents loading when the throttle is opened quickly.

There is only one adjustment on the carbureter and that is the needle valve itself. In fact the company makes a point of the argument that no tools are needed in making adjustment or cleaning but all the work may be done with the fingers.

The Principle of Operation

To explain the principle of operation of the carbureter, it might be stated that it is constructed with the object of taking the fuel in at one point and breaking the particles of gasoline fine enough to be carried in suspension to the cylinders. The difficulty to be overcome in accomplishing this is that the gas particles on meeting the first obstruction or wall that will turn them in another direction have a tendency to revert to their original liquid form. By giving the gas great speed in the venturi *V* and then surrounding it with an outside wall of air which will hold it in suspension in the center, the Edwards design overcomes this.

It will be noticed that an inside needle *D* is used to meter the fuel. The purpose of this is to keep the gas from touching at any point. It is the belief of the designer that if an outside needle were used the fuel would cling to that needle and follow it by capillary attraction outside the zone of high speed so that when it left at the end of the needle it would leave in heavy drops. The needle is controlled by the air

valve *A* by a control bar at the lower end of the air valve stem. The end of the bar is bifurcated and sets over a collar *C* on the metering pin or gasoline nozzle. The collar has a groove in it which allows a certain amount of play in the movement of the control bar as it in turn is moved by the air valve. If the metering pin were set to a rich idling mixture, the groove would permit the air valve to open and allow sufficient air to enter to reduce the rich mixture to the economical operating point.

Compensating Dashpot Used

At the bottom of the air valve stem will be noticed a dashpot *B* or compression chamber. This is used to compensate for the lack of the gasoline on the quick opening of the throttle. The moment that atmospheric pressure opens the air valve, that movement is transmitted to the dashpot piston which in turn creates a pressure in the dashpot chamber. This chamber has gasoline in it and the latter is drawn through passages *P* from the float chamber to the upper part of the compression chamber. This is to relieve the vacuum that ordinarily would be created on top of the chamber in the downward movement of the piston. A horizontal venturi passage *E* from the float chamber to the compression chamber is provided to allow a free movement of the gasoline in one direction but restricted in the other and at the same time to raise the compression at that point.

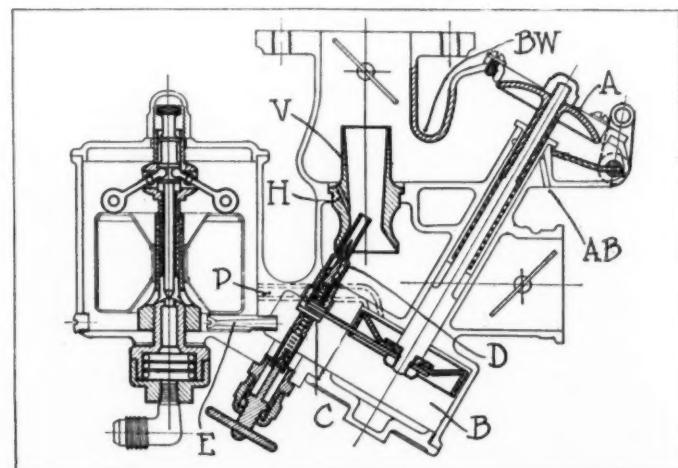
Heating the Incoming Air

The heated primary air passes around the throat of the venturi so that not only will the heat itself help to vaporize the liquid but the venturi also be kept hot. After it is warmed up, the hot air no longer is applied at that point as any heat added to the charge before its entry to the cylinder will be deducted from the final power output.

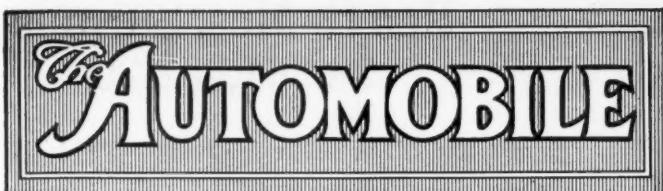
The cold weather adjustment is not a delicate one but instead of a highly sensitive needle to make adjustments with, the Edwards uses a spring tension which varies the vacuum in the body of the carbureter to draw more or less vapor from the nozzle as the condition demands. In starting in cold weather, the operator will pull up the weather adjustment to its limit which would not only raise the vacuum in the body of the carbureter but also would seal the air valve.

The needle valve has a beveled seat and is floating so that dirt would be unlikely and a twist of the valve releases any accumulating. The outside connections of the float needle permits the location of a leak in the float chamber. The metering pin is ball shaped so careless repairing does not put it out of commission.

To relieve any vacuum that might be caused along the air valve stem, this is open to the air through the hole *AB*.



New Edwards carbureter. Note that the only adjustment on the carbureter is that of the needle valve



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\$1,000

THE nearer it gets to the time of the national shows the clearer it becomes that one of the outstanding features of them will be the remarkable value offered by cars costing close to \$1,000. There is a wonderful difference between the \$1,000 car of 1916 and that of a year ago, almost, one might say, it is a totally different class of vehicle.

In 1914 a \$1,000 car was a cheap car; it was around \$1,500 that one began to find cars that were wholly good and not merely good for the money. To-day, most of the \$1,000 class are thoroughly fine examples of engineering, of body construction, and of efficiency in the widest sense.

A year ago a man looking for a quality car without regard for the price would only rarely have been attracted by the engineering quality or the appearance and finish of any machine costing so very much less than \$2,000. To-day there are several \$1,000 cars which would arrest the attention of any show visitor unless he were seeking an essentially large vehicle. Perhaps this fact records the most remarkable achievement of the automobile industry to date. It is quite as remarkable as the value given in the really cheap cars which still look a little cheap, and it makes a strong appeal to that large class which prefers something small and thoroughly excellent for its limited amount of cash, to a larger and confessedly cheap article.

Aluminum Will Be Cheaper

TAKING a line right through the speech made by A. V. Davis, president of the Aluminum Co. of America, at Detroit, last week, it appears that aluminum will be a little cheaper within a few months, provided that the demand does not increase greatly in the meantime. That it will return to a more normal price only so soon as the war shall end, and importation recommence. But another thing, too, is obvious—namely, that after the war America will be able to turn out far more aluminum than ever before.

At present we are told the output is 80 per cent above normal. In the spring it will be more than double the average for the past five years. In three to five years' time it may be very much greater again. Add to this increase in home production the foreign exports of aluminum to this country, and it follows that the amount of aluminum available in 1918 or 1919 will be vastly greater than ever before in history. Mr. Davis refrained from prediction as to the price to be expected, but made it clear that water power legislation had a powerful influence on the cost of production. Since ore is plentiful and very cheap, it is to be hoped that power will be forthcoming soon, for it is hard to think of any application thereof which would be of greater benefit to the world in general than in providing large quantities of a metal which is ideal for very many purposes besides those of the automobile.

S. A. E. Sections Important

THE present year has seen the various local sections of the S. A. E. increased in number and fomented in activity. Not only are the meetings of the sections showing a better attendance, but they are obtaining papers which rank very highly. In Detroit and at Indianapolis this fall there have been discussions as keen as any in a general meeting, there has been an attendance of engineers equal almost to that on the summer meeting lake trip.

This is a splendid thing for the good of the industry, and the fact that the activity of the sections has grown gradually shows that it is a natural, healthy state of affairs which we now see. To a great extent the success of the section depends on the men who make its officers, but as the sections grow in strength this will change a little and the honorary officials will not be called upon for so great an amount of hard work in getting the men together at the meetings and in securing new members.

The reading of one good paper encourages the production of another, and as the basis of the S. A. E. is wide enough to cover a multitude of subjects, there is always a fresh angle for somebody to tackle. There are many commercial matters quite as important as the engineering subjects and signs are appearing which indicate these will obtain a growing amount of recognition. The section activities are showing non-technical members of the industry how far-reaching is the beneficial influence of the society.

17 Members in G. M. Board

No Action Taken on Common Dividend—Production and Sales Larger

NEW YORK CITY, Nov. 17—At the annual meeting of the stockholders of the General Motors Co. yesterday in Jersey City, the directorate was increased from fourteen to seventeen members. President C. W. Nash said regarding the affairs of the company that all the companies in the General Motors Co. are now for the first time since he has been associated with the company on a paying basis. From Aug. 1 to Nov. 11, the company's production was 12,250 cars in excess of a year ago, while the sales were 13,250 cars ahead of those in the same period of a year ago. The company has a large cash balance, notwithstanding that recently the total of \$11,000,000 has been paid in dividends and retirement of notes.

No action was taken regarding a common dividend at the meeting yesterday. The matter was left until the next meeting.

The slate of directors agreed upon at the directors' meeting on Sept. 18 is as follows: Lamont Belin, director of the Aetna Explosives Co.; L. G. Kaufman, president of the Chatham & Phoenix National Bank; Pierre du Pont, S. F. Prior of the Union Metallic Cartridge and Remington Arms Co.; A. H. Wiggin, C. H. Sabin, J. A. Haskell, A. G. Bishop, E. W. Clark, W. C. Durant, H. J. McClement, C. S. Mott, C. W. Nash, Thomas Neal, J. J. Roskob, Albert Strauss and J. J. Storrow.

The old and new boards are compared as follows:

New Board	Old Board
E. W. Clark	E. W. Clark
J. H. McClement	J. H. McClement
Thomas Neal	Thomas Neal
C. S. Mott	C. S. Mott
C. W. Nash	C. W. Nash
J. J. Storrow	J. J. Storrow
Albert Strauss	Albert Strauss
W. C. Durant	W. C. Durant
Lamont Belin	Joseph Boyer
L. G. Kaufman	R. F. Herrick
Pierre du Pont	E. D. Metcalf
S. F. Prior	M. J. Murphy
A. H. Wiggin	N. L. Tilney
C. S. Sabin	Jacob Wertheim
J. A. Haskell	
A. G. Bishop	
J. J. Roskob	

Gatlin Off for South Africa

DETROIT, MICH., Nov. 13—Guy G. Gatlin sailed Nov. 1 from London, where he will proceed to Cape Town, South Africa. He has been appointed South African sales manager of the export department of the Hupp Motor Car Co.

Lockhart Heads Wright Aeroplane

NEW YORK CITY, Nov. 15—Henry Lockhart, president of the Simplex Automobile Co., New Brunswick, N. J., was elected president of the Wright Aero-

plane Co., Dayton, Ohio, which was recently purchased by a syndicate headed by W. B. Thompson. The company has increased its capital from \$1,000,000 to \$5,000,000. Mr. Lockhart sailed for England Friday in the interests of the company.

T. Frank Manville, president of the H. W. Johns-Manville Co., resigned as president of the Wright company because he found that he could not give sufficient time to the interests of the company. He remains, however, as a member of the executive committee and as a director.

Three More N. A. C. C. Members

NEW YORK CITY, Nov. 16—Three more companies have been admitted to membership in the National Automobile Chamber of Commerce, Inc. They are the Denby Motor Truck Co., Detroit, Mich., maker of Denby trucks; Grant Motor Co., Findlay, Ohio, Grant car; and Dort Motor Car Co., Flint, Mich., Dort car.

Vanderlip an S. K. F. Director

HARTFORD, CONN., Nov. 11—Frank A. Vanderlip, president of the National City Bank, has been elected a director of the S. K. F. Ball Bearing Co., this city, recently incorporated to take over the business of the S. K. F. Ball Bearing Co. of New York.

Besides Mr. Vanderlip, the board will consist of B. M. W. Hanson, vice-president of Pratt & Whitney, Hartford, Franklin B. Kirkbride of 7 Wall Street, A. Carlander and S. Winquist, directors of the Swedish S. K. F. Co., which is a large holder in the new American corporation, and B. G. Prytz, who will act as president.

Morrey V. P. of Hayes Wheel Co.

JACKSON, MICH., Nov. 11—W. C. Morrey, manager of the timber department of the Hayes Wheel Co., has been promoted vice-president, while William C. Snyder and H. D. Hartley, Piqua, Ohio, have become members of the board of directors. The company's capital stock was recently increased to \$1,000,000.

Sun Buys Plant in Elkhart

BUFFALO, N. Y., Nov. 15—The Sun Motor Car Co., this city, is preparing to move its plant to Elkhart, Ind. Preparatory to coming here the concern has purchased for \$25,000 the plant of the Sterling Motor Car Co. The company will manufacture a light six-cylinder car and expects to begin operations about Jan. 1.

180,243 Cars in Ohio

COLUMBUS, OHIO, Nov. 13—According to a report recently issued by Registrar W. H. Walker, 180,243 automobiles were registered up to Nov. 10.

Reo 10-Mos. Surplus \$3,661,802.20

\$1,969,720.20 Over 1914 —
\$2,390,951.60 Cash on Hand and in Banks

LANSING, MICH., Nov. 13—On Aug. 31 1915, at the end of ten months of its fiscal year, the Reo Motor Car Co. had \$3,661,802.20 surplus or \$1,969,720.20 more than at the end of its entire 1914 fiscal year. During the same period of ten months, the cash on hand or in banks totaled \$2,390,951.60 as compared with \$738,145 in 1914, meaning an increase in cash disponibile of \$1,652,806.60.

The assets total \$7,373,995.99 while for twelve months in 1914 they totaled only \$5,120,782, an increase of \$2,253,213.99 in favor of the current year.

These assets include the cash item already referred to; notes and accounts receivable, less reserves, \$582,176.46 instead of \$684,184 in 1914; inventories, \$1,957,708.74 as compared with \$1,923,212 in the previous fiscal year. The capital assets are recorded for a total of \$2,427,592.45 while in 1914 they totaled \$1,765,989. Investments total \$3,000 and deferred charges \$12,565.74.

Among the liabilities, capital stock remains at \$3,000,000; current liabilities total \$712,192.79; accounts payable, \$653,637.27 as compared with \$368,407 in 1914; surplus \$3,661,802.20.

Reo Truck Assets Gain \$231,510.09 in 10 Months

LANSING, MICH., Nov. 13—During ten months of the fiscal year 1915, or up to Aug. 31, the balance sheet of the Reo Motor Truck Co. shows assets to be \$1,409,251.09 or an increase of \$231,510.09 over the twelve month's record of 1914.

The cash balance which was \$266,242 in 1914 shows a total of \$656,616.42 this year. Bills receivable totaled \$191,435.95 against \$73,027 in 1914. Inventory is recorded at \$349,912.35 or \$40,000 more than last year. The item of tools, machinery, etc., is credited with \$102,884.51 as compared with \$96,553 last year.

Among the liabilities the outstanding capital stock is unchanged at \$937,500; bills payable total \$200,179.67 instead of \$142,479 last year; accrued pay roll totals \$9,652.07 prepaid expenses, \$6,488.61 and the surplus is shown to be \$250,680.74 as compared with \$91,062 last year.

Ferry Delion Tire Sales Manager

TRENTON, N. J., Nov. 11—C. C. Ferry has been appointed sales manager of the Delion Tire & Rubber Co., Trenton. Mr. Ferry will make his headquarters at the factory in Trenton.

New Abbott Six for Under \$1,200

Continental Motor $3\frac{1}{4}$ by $4\frac{1}{2}$ with Detachable Head—Seven-Passenger Body

DETROIT, MICH., Nov. 15—The Consolidated Car Co., maker of the Abbott-Detroit, will soon have ready for market a six-cylinder model to be known as the Six-44, and to sell at a price under \$1,200. Although the complete details will not be available for about two weeks, it is known that the car will have a $3\frac{1}{4}$ by $4\frac{1}{2}$ motor of Continental make. The six cylinders and the upper half of the crankcase are in one piece with head removable.

The car is to have a wheelbase of 122 in. and will seat seven. The shape of the body and its general lines are to be in accord with latest body ideas, it is said. Nearly straight, semi-elliptic springs are to be used all around, the rear pair being 57 in. long. The clutch is a dry disk type and the gearset three speed. A two-unit starting and lighting system will be fitted, the starting motor connecting through the Bendix drive. Battery ignition is to be used.

Disco Corp. Takes Co.

DETROIT, MICH., Nov. 16—*Special Telegram*—The Disco Electric Starter Co. has been taken over by the Disco Electric Starter Corp., just formed and capitalized at \$250,000. The plant will be enlarged and its production facilities greatly increased.

The new officers of the company are: President, S. W. Elston; vice-president, J. F. Johnson; secretary-treasurer, Sol Meyer, and sales manager, Manzell Hackett.

Sterling Four at \$550

NEW YORK CITY, Nov. 15—The Sterling Automobile Mfg. Co., Inc., this city, is bringing out a four-cylinder roadster to sell at \$550, the price including two-unit electric starting and lighting system. The motor is a Sterling, water-cooled, having a bore of $2\frac{1}{2}$ in. and a stroke of 4 in., is block-cast and has overhead valves. The company will put this car on the market shortly and it will be displayed at the New York show.

Ford Reduces Closed Car Prices

DETROIT, MICH., Nov. 16—The Ford Motor Co. has reduced prices on its sedan and coupelet. The sedan, which formerly was \$975, is now \$740, a reduction of \$235. The body sells separately for \$400. The coupelet is reduced from \$750 to \$590, a reduction of \$160. This body sells for \$250.

THE AUTOMOBILE

The runabout remains \$390, the touring car \$440 and the chassis \$360. The sedan and coupelet are not of the detachable type. Each is a complete body in itself. Both fit the standard Ford chassis. Deliveries on this winter's cars are just beginning. All prices are f.o.b. Detroit.

Frank Briscoe Is Briscoe Manager

JACKSON, MICH., Nov. 11—Frank Briscoe, brother of Benjamin Briscoe, president of the Briscoe Motor Co., has been appointed general manager, succeeding Horace De Lisser, who held that position and is vice-president of the company.

Evans Perfection Tire V-P

FRANKLIN, PA., Nov. 11—R. J. Evans, president and general manager of the Franklin Mfg. Co., has resigned to accept the vice-presidency of the Perfection Tire & Rubber Co., Fort Madison, Iowa, which was recently formed to build a heat-and-water-proof tire, guaranteed to give satisfactory service for 7000 miles without punctures or blowouts.

Yoke Is Maxwell District Supervisor

DETROIT, MICH., Nov. 10—John Yoke, who was sales supervisor of zone No. 5 of the Maxwell Motor Co., has been promoted district supervisor of sales and will have charge of all the field men and the twelve field headquarters which are maintained by the Maxwell company as wholesale and contracting centers.

Hinckley with Connecticut

CHICAGO, ILL., Nov. 12—P. P. Hinckley of Chicago has joined the sales force of the Connecticut Telephone & Electric Co. and will handle the jobbing trade East of Chicago. The jobbing connections in Chicago and the West will be managed by J. W. Fulton with offices at 1100 Karpen Bldg., Chicago.

Hanson with Service Truck

WABASH, IND., Nov. 13—A. B. Hanson, until recently manager of service department of the Chalmers Motor Co., Detroit, Mich., is now general manager of the Service Motor Truck Co. The plant of the Service company is now being doubled.

W. McK. White Leaves Esterline

INDIANAPOLIS, IND., Nov. 13—W. McK. White, sales manager of the Esterline Co., this city, has resigned. Mr. White formerly was associate editor of *THE AUTOMOBILE*, and gave up that work to become advertising manager of the Premier Motor Mfg. Co., resigned that position to handle the advertising of the Marion Motor Car Co. and then entered the Esterline company as sales manager some two years since.

18,000 Chalmers 6-30's in 6 Months

600 Dealers in Convention at Factory Hear Big Production Plans

DETROIT, MICH., Nov. 15—The annual convention of the Chalmers Motor Co.'s dealers opened at the new auditorium of the plant at 10 a. m. to-day. President Hugh Chalmers made the address of welcome.

At this first meeting of the dealers with the officials of the company they were told that it is the intention of the Chalmers company to build, during the next six months, 18,000 of the new Chalmers Six-30 cars, a new model described on pages 925-927, which is to sell at \$1,050, or lower than any Chalmers car previously produced. It was stated by officials that dealers have contracted for \$22,000,000 worth of the new models.

Out-of-town dealers have been coming in since Saturday and it is expected that fully 600 will be seated at the dinner, which will be served to-night in the convention hall of the Hotel Ponchartrain. At this hotel 238 Chalmers dealers were seated at the breakfast tables this morning. A large number are registered at other hotels. At the Ponchartrain it was stated that the number of dealers there is the largest from one manufacturer which the hotel had to take care of during the last four or five years.

During the morning after the dealers had placed their orders, a parade of some 300 Chalmers cars was held. To-day's morning session was merely one of welcome.

Tuesday, Nov. 16, there will be business sessions throughout the day, and inspection of the plant. In the evening a dinner and cabaret show will be given at the Hotel Statler. Wednesday will be featured by a detailed discussion of the new Chalmers Six-30 by Chief Engineer C. C. Hinckley. The afternoon will be taken up by a business session and the evening will see the close of the convention, the final event being a banquet to be tendered the dealers at the Detroit Athletic Club.

Bell Monarch Sales Manager

DETROIT, MICH., Nov. 12—J. L. Bell, who has been service manager of the Monarch Motor Car Co., has been promoted to sales manager of the company. Mr. Bell has been connected with the automobile business since 1909, starting with the Staver Carriage Co., Chicago, and later being with Abbott and R-C-H. The Monarch company has opened a branch at 270 Jefferson Avenue, under Mr. Bell's management.

Big Truck Orders Keep United Kingdom Our Best Customer—Export Statistics

In September Great Britain Took 2650 American Cars and Trucks Worth \$3,119,806—France's Purchases Jump from 1044 to 4885 for Nine Months—Other Increases

WASHINGTON, D. C., Nov. 16—In addition to the gross figures of exports of automobiles for September and the nine months ended September, together with the figures for the corresponding periods of last year, previously published in *THE AUTOMOBILE*, herewith are presented the export figures for the various countries that have participated in the automobile trade of this country during those periods.

United Kingdom Gains

The big feature of the export trade is the tremendous increase in the exports to the United Kingdom, and while the figures do not show it, the increase is undoubtedly due to the orders for trucks. In September last Great Britain imported 2650 cars, valued at \$3,119,806, as against 136 cars, valued at \$154,763, in September a year ago. During the nine months ended September, these exports increased from 5130 cars, valued at \$4,281,026, in 1914, to 19,434 cars, valued at \$28,648,749, in 1915.

There were no exports of automobiles to France in September, 1914, while in September last 421 cars, valued at \$916,830 were exported to that country. During the nine months' period these exports rose from 1044 cars, valued at \$625,636, in 1914, to 4885 cars, valued at \$12,126,628, in 1915.

Coming back to this side of the ocean

the figures show that Canada imported 260 cars, valued at \$433,620, in September, 1914, while in September last the number increased to 367 cars, but the value thereof was only \$278,382. During the nine months of 1914 the number of cars shipped across the Northern border was 3,854, valued at \$4,881,062, while during the nine months of this year the number was 5049, but the value was only \$3,951,585.

The West Indies and Bermuda are rapidly becoming good customers for American-built motor cars. In September a year ago forty-two cars, valued at \$37,240 were shipped to those islands, while in September last the number was 286 and the value \$194,832. During the nine months' period the number of cars shipped there increased from 394, valued at \$342,550, in 1914, to 2385 cars, valued at \$1,305,005, in 1915.

Increase to South America

That American car manufacturers are reaching out for South American trade is indicated by the fact that during September, 1914, there were only twenty-four cars, valued at \$19,735, shipped to those countries, while during September last the number was 595 and the value, \$273,449. Even greater gains are shown in the figures for the nine months' period, the number for 1914 being 915 cars, valued at \$742,262, while

in 1915 the number was 2081, and the value \$1,066,486.

British Oceania is also taking a liking for American cars, 219 of them, valued at \$155,597, being shipped there in September a year ago, while in September last the number increased to 387 and the value to \$312,856.

A fine showing is also being made in the exportations to Asia and other Oceanic countries, 387 cars, valued at \$312,856 having been shipped there in September last, as against thirty-nine cars, valued at \$38,975, exported there in September a year ago. The complete table is given herewith.

Walker Co. Goes to Cleveland

DETROIT, MICH., Nov. 13—The J. H. Walker Co. automobile parts manufacturer who started in business here in 1910 and who has been making many of the parts for the Chandler Motor Car Co., Cleveland, will locate in the Ohio city about Dec. 1. A factory building having 45,000 sq. ft. of floorspace is now almost ready for occupancy. Another building will be erected within a short time. New machinery and equipment valued at over \$100,000 will be installed.

Joliet Tractor at \$865

JOLIET, ILL., Nov. 12—The Joliet Tractor Co., Joliet, Ill., has brought out a farm tractor, which it has christened the Bates Steel Mule. One of the features of this tractor is the oscillating crawler, which acts very much like a human being walking on the ball of the foot. The load-pulling on the compound lever hitch, combined with the downward force of the springs, have a tendency to pull the front end of the crawler into the ground. Offsetting this action is the weight of

Exports and Imports of Automobiles and Parts for September and Eight Preceding Months

EXPORTS BY COUNTRIES

Automobiles and Motor Trucks

	September				Eight months ending September			
	1914	Value	1915	Value	1914	Value	1915	Value
France	.....	.....	421	\$916,830	1,044	\$625,636	4,885	\$12,126,628
Germany	.....	.....	49	34,516	1,063	799,552	4	2,801
Italy	2	\$1,860	.....	.....	231	150,248	170	109,014
United Kingdom	136	154,763	2,650	3,119,806	5,130	4,281,026	19,434	28,648,749
Other Europe	12	9,570	1,144	3,341,676	2,390	1,896,217	6,688	18,082,964
Canada	260	433,620	367	278,382	3,854	4,881,062	5,049	3,951,585
Mexico	8	8,810	5	4,160	68	79,184	75	71,891
West Indies and Bermuda	42	37,240	286	194,832	394	342,550	2,385	1,305,005
South America	24	19,735	595	273,449	915	742,262	2,081	1,066,486
British Oceania	219	155,597	387	312,856	2,885	2,449,630	3,147	2,681,592
Asia and other Oceania	39	38,975	442	486,757	1,232	1,168,380	2,950	5,189,938
Other countries	32	32,022	180	134,450	961	860,762	1,464	1,326,536

PARTS, NOT INCLUDING ENGINES AND TIRES

All Countries	.....	\$343,618	.....	\$1,613,419	.....	\$4,451,163	.....	\$10,994,859
ENGINES								
70	\$16,211	1,014	\$110,330	2,742	\$955,982	10,647	\$1,447,001	
TIRES								
England	.....	\$134,801	.....	\$920,328	.....	\$1,071,061	.....	\$4,101,320
Canada	.....	53,419	.....	124,548	.....	795,972	.....	817,463
Mexico	.....	8,341	.....	7,517	.....	50,165	.....	78,904
Philippine Islands	.....	14,886	.....	1,164	.....	92,575	.....	196,186
Cuba	.....	.....	.....	31,954	.....	.....	.....	219,609
Australia	.....	.....	.....	52,341	.....	.....	.....	364,096
Germany	.....	.....	.....	.....	.....	81,917	.....	.....
Belgium	.....	.....	.....	.....	.....	301	.....	.....
Other countries	.....	54,812	.....	253,987	.....	464,362	.....	1,123,743

THE AUTOMOBILE

Peerless Eight at
\$1,890New 2-Ton Truck Is Under
Way—Co. Will Maintain
Corporate Existence

CLEVELAND, OHIO, Nov. 15—The Peerless Motor Car Co., a majority of the stock of which was recently acquired by the Peerless Truck & Motor Corp., and which has also secured control of the General Vehicle Co., will continue as it has in the past maintaining a separate corporate existence. It will manufacture the eight-cylinder Peerless car, for \$1,890, deliveries to begin in December and will also manufacture a regular line of Peerless trucks, to which a new 2-tonner will soon be added. The present executive force, sales, and factory organization will be continued without change.

The Peerless Motor Car Co., will be represented on the board of the Peerless Truck & Motor Corp., by L. H. Kittredge,

president of the Peerless Motor Car Co., B. G. Tremaine, and F. S. Terry, all of the Peerless company.

The Peerless Truck & Motor Corp. reports consolidated balance sheet of its subsidiaries, the Peerless Motor Car Co. and General Vehicle Co., Inc., as of Sept. 30, 1915, after giving effect to adjustment incident to the acquisition of stocks as in the accompanying table.

Transport Is Latest Tractor

NEW YORK CITY, Nov. 3—The Transport tractor is the latest addition to the roster of American commercial vehicles. It is produced in one 5-ton model by the Transport Tractor Co., Long Island City, N. Y. The tractor attains a very short wheelbase by placing the unit power plant between the seats, and is worm-driven. It has a new type of trailer connection for semi-trailers, consisting of a dome and cup, the dome mounted by the king bolt and the cup carrying the cup and king bolt guide. It is designed to turn in a circle of 25 ft. diameter, and is priced at \$2,500.

Willys-Overland, Ltd., Formed in
Canada—\$6,000,000 Capital

TOLEDO, OHIO, Nov. 17—The Willys-Overland, Ltd., has been formed in Canada with a capital of \$6,000,000 and head offices in Toronto. J. N. Willys, head of the Willys-Overland Co., this city, will be president of the new company. T. A. Russell, at present vice-president of the Russell Motor Car Co., of Canada, will be vice-president.

Five of the directors of the Willys-Overland Co. of Toledo, will be directors of the new company; these are J. N. Willys, H. T. Dunn, Walter Stewart, Harry Shepler, C. A. Earl, T. A. Russell and Lloyd Harris of Toronto, and two of the other Canadian stockholders will also be on the board.

This new company will take over the complete automobile business of the Russell Motor Car Co., and all of the business in Canada of the Willys-Overland Co.

Although the Canadian company will be independent of the parent company and will be conducted entirely independent as a Canadian corporation, it will have the advantage of the advice and engineering skill of the Willys-Overland Co. organization. The plan is to undertake in Canada the actual manufacture of both Overland and Willys-Knight automobiles. For this purpose the plant of the Russell Motor Car Co. of Toronto has already been acquired and this quickly will be enlarged to permit quantity production.

Racine Rubber Adds

RACINE, WIS., Nov. 13—The Racine Rubber Co., this city, has broken ground for a large addition to its plant at Racine Junction, established about four years ago. The building will be three stories high, of steel, brick and concrete, and with equipment will cost in excess of \$100,000. The addition will be used for the mill room and crude rubber storage. It is to be ready for occupancy on Feb. 1, at which time the company will add more than 100 men to the payroll, making a total of 750 operatives.

Consolidated Balance Sheet of Peerless Truck Motor Corp.

ASSETS	
Patents, franchises and goodwill.....	\$5,100,000.00
(\$5,000,000 of this represented by common stock of General Vehicle Co., Inc.)	
Capital assets:	
Land	\$967,153.61
Buildings, plant and equipment.....	3,697,114.81
	4,664,268.42
Current assets:	
Investments	\$19,035.80
Inventories of finished goods, work in process, raw materials and supplies at factories and branches and on consignment	1,308,832.39
Accounts and notes receivable	685,946.40
Cash in banks and on hand.....	2,376,082.43
	4,389,897.02
Deferred assets:	
Prepaid expenses and insurance.....	\$46,695.18
Development, engineering expenses, etc.....	161,866.02
	208,561.20
	\$14,362,726.64
LIABILITIES	
Capital stock issued and outstanding:	
Peerless M. C. Co., 7% cum. pref.....	\$2,100,700.00
Peerless M. C. Co., common.....	2,085,500.00
	4,186,200.00
General Vehicle Co., Inc., 7% cum. pref.....	\$1,200,000.00
General Vehicle Co., Inc., common.....	5,000,000.00
	6,200,000.00
Funded debt (for the retirement of which cash has been provided for by the new company):	
First mortgage serial gold 6% bonds of the Peerless M. C. Co.:	
Issued and outstanding.....	\$900,000.00
Less—Since retired or to be retired by the Peerless M. C. Co.	300,000.00
(Money has been deposited with the trustee for the purchase of these remaining bonds as shown below.)	
Mortgage on real estate in New York City.....	\$600,000.00
	300,000.00
	900,000.00
Current liabilities:	
Special deposits	\$126,275.00
Accounts payable	557,308.78
Sundry creditors, including accrued payroll.....	127,378.17
	810,961.95
Reserves, including reserve against inventories, doubtful accounts, etc.	197,531.99
Surplus:	
Surplus capital to be created by cancellation of notes payable of General Vehicle Co., Inc., Oct. 31, 1915.....	\$900,000.00
Undivided surplus	1,168,032.70
	2,068,032.70
	\$14,362,726.64
In the acquisition of the capital stock of the Peerless M. C. Co. and the General Vehicle Co., Inc., there have been issued by the Peerless Truck and Motor Corp.:	
Capital stock, 200,000 shares, par value \$50.....	\$10,000,000
(Authorized issue 400,000 shares.)	
Ten-year 6% convertible gold notes.....	5,000,000
There has been deposited with the trustee, to retire the balance of the outstanding bonds of the Peerless M. C. Co.	600,000
Also there has been deposited with the trustee to acquire the balance of the outstanding shares of the Peerless M. C. Co.	637,695
Cash in bank.....	292,500
The company has no liabilities except the 6% convertible gold notes above stated	

S. A. E. Forms Penn. Section

Headquarters and Membership Problems Solved—Engineers' Club to Co-operate

PHILADELPHIA, PA., Nov. 11—At a meeting held here last night, the movement which has been on foot for some time, to organize a local section of the Society of Automobile Engineers has finally borne fruit. A new section, subject to the approval of the council of the parent body has been created under the name of the Pennsylvania Section.

There were about fifty in attendance at the meeting and the dinner which preceded it, out of which about half were members of the S. A. E. and the remainder were members of the Electric Vehicle Association and others who intend to become affiliated with the new section. The unanimity of opinion that the section should be formed and the enthusiasm which marked the initiation of the new organization give promise of a successful and rising branch of the parent organization.

E. S. Foljambe who has been one of the fathers of the movement, acted as toastmaster at the dinner and afterwards as temporary chairman. In speaking of the reason for the failure of the previous attempt, some years ago, to maintain a section of the S. A. E. in Philadelphia, Mr. Foljambe pointed out that the two main causes for lack of success have now been removed and there remains no apparent reason why the present undertaking should not succeed. The two causes referred to were the lack of a permanent headquarters and the former limitations on section membership which rendered it impossible constitutionally to have enough prospective members to draw upon.

Vote Was Unanimous

After stating the purposes of the gathering and dwelling upon the desirability of having a section of the society in Philadelphia, Mr. Foljambe turned the meeting over to Coker F. Clarkson, general manager of the S. A. E. With but little preliminary discussion, B. B. Bachman, of the Autocar Co., moved that it be considered the sense of the meeting that a section of the society be formed with its headquarters in Philadelphia. This was carried unanimously.

The next point which came up for discussion was as to the proposed name of the new section. The name Keystone was suggested by some as having a broad meaning and at the same time giving an idea to the locality. Others wanted the name Philadelphia section, but Pennsylvania was finally adopted. A

temporary nominating committee for the purpose of choosing temporary officers was then named by Mr. Clarkson and while they debated this matter the question of a suggested meeting program was brought up.

K. W. Zimmerschied, chairman of the standards committee of the S. A. E., stated that he believed it would be a mistake to have too many meetings in the beginning as they would be apt to lack the importance which would attach to a shorter but more carefully thought-out program. The importance of giving the members of the section something to do he stated as another successful method of promoting interest. Mr. Zimmerschied dwelt on the importance of carefully selecting the officers of the section as the success of the organization depends largely on the efforts of the chairman and secretary. Coming to the matter of standards he went on to state an illustration of the importance of this work to the country. This country is going to manufacture hundreds of millions of dollars worth of ammunition, he said, but of what value will it all be if it is not standardized? This work of standardization is one in which the S. A. E. can be of valuable assistance.

Army and Navy Co-operation

Louis S. Clarke, vice-president of the Autocar Co., brought up the matter of encouraging army and navy officers to take part in the activities of the section. He pointed out that the appropriations of Congress for military automobiles will be enormous and that if this is the case, naturally the officers of both branches of the service will take an immense interest in a field which will undoubtedly claim such a large share of the appropriations. Mr. Clarke's views met with the approval of a great many of those present who spoke endorsing his sentiments.

Temporary Officers Elected

The temporary officers appointed by the nominating committee are E. S. Foljambe, Chairman; B. B. Bachman, secretary and Tinius Y. Olsen, treasurer. An application will be made to the parent organization for a section charter in the near future.

In discussing the manner in which the difficulties formerly encountered were solved it was brought out that the Engineers' Club of Philadelphia, which acts in co-operation with most of the local branches of the national engineering societies, has extended the use of the meeting room of the club to the new organization. Space for announcements has been given in the club bulletin and the members attending the meetings will have house privileges for the night of the meeting. In addition, the extensive library of the club has been put at their disposal.

The other difficulty, that of having but a small S. A. E. membership to draw upon, has been removed by the possibility of having section affiliates. The constitution of the S. A. E. now permits sections to have affiliate members who are not members of the S. A. E. These affiliates are allowed to attend the meetings and enter into the discussions but are not entitled to a vote. The large field of this class of membership in the Philadelphia territory opens up great possibilities for extensive membership.

Many Prospective Members

The section will embrace all of Pennsylvania and will accept members from New Jersey. Since the outbreak of hostilities abroad many steel and other manufacturing companies are engaged in making trucks, included among which are the Midvale Steel and Ordnance Co. and the Baldwin Locomotive Works, in addition to a number of others. Not only these people will be induced to become members but the engineering student body at the University of Pennsylvania will be asked, by reason of the fact that many, upon their graduation, will take up the automobile industry as their vocation.

At the close of the meeting E. R. Whitney, engineer of the Commercial Truck Co. of America, delivered an address on the use of electric trucks in difficult installations. The lecture was illustrated by stereopticon views of the different installations. Those who registered were as follows:

- Coker F. Clarkson, S. A. E., New York City.
- Karl W. Zimmerschied, General Motors Co., Detroit, Mich.
- Frank E. Whitney, Commercial Truck Co., Philadelphia, Pa.
- W. A. Manwarling, 1208 N. Thirty-first St., Philadelphia, Pa.
- E. J. Hancock, Curtis Publishing Co., Philadelphia, Pa.
- W. H. Metcalf, 11 N. Twenty-first Street, Philadelphia, Pa.
- W. H. Patton, 1828 Market St., Philadelphia, Pa.
- H. A. Koockegoy, Tenth and Chestnut Sts., Philadelphia, Pa.
- W. W. Norton, Autocar Co., Ardmore, Pa.
- A. H. Burns, 305 S. Broad St., Philadelphia, Pa.
- E. R. Whitney, Commercial Truck Co., Philadelphia, Pa.
- R. B. Daggett, Commercial Truck Co., Philadelphia, Pa.
- B. B. Bachman, The Autocar Co., Ardmore, Pa.
- S. M. Wilson, The J. G. Brill Co., Philadelphia, Pa.
- M. J. Oswald, The J. G. Brill Co., Philadelphia, Pa.
- Wm. H. Palmer, Jr., Electric Storage Battery Co., Philadelphia, Pa.
- Frank Beemer, Pressed Steel Mfg. Co., Philadelphia, Pa.
- William Reiter, Jr., Gibney Tire & Rubber Co., Philadelphia, Pa.
- Walter H. Hart, Standard Roller Bearing Co., Philadelphia, Pa.
- Geo. T. Gwilliam, 1304 Arch St. and 57 Broadway, New York City.
- Frank H. Schoenfus, Standard Roller Bearing Co., Philadelphia, Pa.
- Harold Goodwin, Jr., Philadelphia Electric Co., Philadelphia, Pa.
- Edward L. Clark, 825 N. Twenty-seventh St., Philadelphia, Pa.
- A. B. Cummer, 553 W. Twenty-third St., New York City.
- Albert G. Sutill, James Boyd & Bro., Inc., Philadelphia, Pa.
- E. S. Foljambe, Chilton Co., Forty-ninth and Market Sts., Philadelphia, Pa.
- Chas. E. Duryea, 3400 N. Seventeenth St., Philadelphia, Pa.
- Louis S. Clarke, Ardmore, Pa.
- E. S. Fretz, Pottstown, Pa.

*John S. Clarke, Ardmore, Pa.
 D. Robert Yarnall, Chestnut Hill, Pa.
 *Edward Dixon, Crowther Motor Co., Philadelphia, Pa.
 Joseph D. Israel, 1000 Chestnut St., Philadelphia, Pa.
 M. G. Lloyd, Chicago, Ill.
 R. Louis Lloyd, 1000 Chestnut St., Philadelphia, Pa.
 H. Wickland, The Hess-Bright Mfg. Co., Philadelphia, Pa.
 *Herbert L. Towle, 214 S. 12th St., Philadelphia, Pa.
 H. R. Doughty, The Hess-Bright Mfg. Co., Philadelphia, Pa.
 *J. Edward Schipper, *The Automobile*, 239 W. 39th St., New York City.
 H. N. Purdy, Edison Laboratory, Orange, N. J.
 *H. E. Figgie, The Perfection Spring Co., Cleveland, Ohio.
 *N. B. Pope, *Automobile Topics*, New York City.
 *A. C. Bergman, Perfection Spring Co., New York City.
 *T. Y. Olsen, Tinius Olsen Testing Mfg. Co., Philadelphia, Pa.
 *W. H. Sackman, Light Mfg. & Fdry. Co., Pottstown, Pa.
 H. W. Berroth, Philadelphia, Pa.
 *Walter M. Newkirk, William Harvey Rowland, Philadelphia, Pa.

*Member S. A. E.

Three Additions for Hydraulic Pressed Steel Co.

CLEVELAND, OHIO, Nov. 11—The Hydraulic Pressed Steel Co. will build three plant additions costing approximately \$50,000 at its factory at 3152 East Sixty-first Street. Two of the additions will be inclosed in glass. One will be 360 by 70 ft., and the other 200 by 80 ft., costing about \$21,000 and \$17,000 respectively. The third structure will be built of brick and steel covering a ground space of 60 by 120 ft. All are to be one story high.

1000 Briscoes to Be Made in Canada

BROCKVILLE, ONT., Nov. 12—T. J. Storey of Brockville, vice-president of Carriage Factories, Ltd., who was in Montreal yesterday, announces that within two or three weeks the Canadian Briscoe Co., a new subsidiary of Carriage Factories, will be turning out four and eight-cylinder medium priced automobiles, and that before the end of the year the company figures on placing on the market at least 1000 of these cars. The company will assemble the parts at Brockville, where the plant of the old Acme Automobile Co. has been taken over, and Carriage Factories will participate in portions of the manufacturing end. The cars to be placed on the market will be identical with the American Briscoe output, which will supply such portions of the car as are not made in Canada.

Fickling to Add 25,000 Sq. Ft.

LONG ISLAND CITY, N. Y., Nov. 13—The Fickling Enameling Corp., this city, is enlarging its plant by the addition of 25,000 sq. ft. to accommodate its assembling plant, and the wood-working, metal-stamping and upholstery departments, to take care of several large contracts recently received from manufacturers.

THE AUTOMOBILE

Maxwell to Build 500 Cars a Day

Extensive Additions Planned for All Plants—Assembly Building Nearly Completed

DETROIT, MICH., Nov. 13.—At all the Maxwell plants in Detroit, Newcastle, Ind., and Dayton, Ohio, extensive enlargement and expansion work has been started, the Maxwell Motor Co. contemplating increasing its daily production, which now averages 250 cars or better, to 500.

The biggest addition is being put up at the Oakland Avenue plant, here in Detroit, which will consist of a one-story building 860 by 130 ft., to be devoted exclusively to assembly purpose. This structure will cover about 4 acres of ground. The Maxwell company owns 50 acres of ground on Oakland Avenue and 12 acres are covered with buildings.

This new assembly building is to be completed within eighty days. Along its length will run two parallel moving platforms, similar to the one on which the company's product is now put together. It was designed by Production Manager Charles Adams, in co-operation with President Walter E. Flanders, for a daily output of 160 cars, but has been turning out more than 250 a day. The Maxwell output record for one day is now 286 cars.

The present platform will form one of the pair to be in the new building. The room vacated will be used in the manufacture of part of the increased number of units which the doubled assembly capacity will make possible.

The property adjoining the Maxwell plant and land on Oakland Avenue and which is occupied by the Gray Motor Co., is controlled by the Maxwell company, and a large part of the main building is operated as a motor factory for the Maxwell.

Walker-Weiss Gets Martin Plant

FLINT, MICH., Nov. 10—The Walker-Weiss Axle Co. has been advised that its bid for the plant of the H. J. Martin Forging Co., Indianapolis, has been accepted by Judge Clifford, of the superior court, of that city. The Indiana concern has been in the hands of a receiver since last January.

For some time the Walker company has contemplated enlarging its plant, but while it would have been easy to put up new buildings, it was found practically impossible to arrange for the immediate delivery of the machinery necessary for a drop forging concern. Therefore a bid was made for the Indianapolis plant, which has fifteen steam hammers with

full equipment for heat treating and much other good material and machinery.

George Desautels, who has been connected with the drop forging business in the United States for the last sixteen years and is vice-president of the American Drop Forge Association, has been appointed general manager of the Walker-Weiss Axle Co.'s Indianapolis drop forge plant.

The Indianapolis plant of the Walker-Weiss Axle Co. will be under the management of Robert I. Gale, until recently purchasing agent for the Keeler Brass Co., Grand Rapids.

3000 Marion and Imperial Cars Planned

JACKSON, MICH., Nov. 10—According to President J. I. Handley of the Mutual Motors Co. there will be 3000 Marion and Imperial cars made for the season 1916. The entire output has been practically contracted for as the result of a recent business campaign in Texas and the East.

Efficiency Oil Co. Buys Plant

ST. LOUIS, Mo., Nov. 13—The Efficiency Oil Corp. has purchased the plant formerly occupied by the Shiras-Chasing Fixture Co., on Kienlen Avenue, in Wellston. The building, which is a one-story structure, contains an acre and a half of floorspace. The company expects to occupy the new building before Dec. 1. The old plant of the company at Manchester Avenue and King's Highway Boulevard will be discontinued at the expiration of the lease the end of this year. The new building contains about ten times the old plant's floorspace.

Yale & Towne Increase Wages 10 per Cent

STAMFORD, CONN., Nov. 11—A general increase of 10 per cent in wages was announced by the Yale & Towne Co. It affects 4600 employees, and means an increase in the company's wage outlay of about \$300,000 per annum.

Bijur Machinists Return to Work

HOBOKEN, N. J., Nov. 13—The strike of 200 machinists in the plant of the Bijur Motor Lighting Co., this city, has been settled. The strikers received a 50-hr. week, and a 5 per cent advance in wages.

Springfield Body Strike Settled

SPRINGFIELD, MASS., Nov. 11—The strike of 400 employees of the Springfield Metal Body Co., this city, on Nov. 1, who demanded an 8-hr. day and recognition of the union, has been settled.

Joy on Aero Club Board

DETROIT, MICH., Nov. 12—President Henry B. Joy, of the Packard Motor Car Co., has been elected a member of the board of governors of the Aero Club of America.

Hyatt Capital Now \$6,000,000

Increase from \$400,000 Rendered Necessary by Enlargement of Plants

NEWARK, N. J., Nov. 13—The Hyatt Roller Bearing Co., this city, will increase its capital stock from \$400,000, its present capital, to \$6,000,000. This increase has been made necessary by extensions to the factory both in the manner of new buildings and added equipment. Four new buildings are under construction, as follows: One building 90 by 115 ft. eight stories high, which is nearly completed; one building, 75 by 200, eight stories; one building, 125 by 200, one story; and one building, 75 by 200, eight stories. Construction work is just beginning on the last three buildings. These buildings will double the capacity of the Hyatt factory, which has been entirely devoted to the manufacture of roller bearings for automobile and other uses. These bearings are manufactured entirely for domestic sales. The present \$400,000 stock is all common, and the new capitalization of \$6,000,000 is common. It is all held privately and the stock is not listed or for sale.

Maxwell Offers First Preferred

NEW YORK CITY, Nov. 16—Holders of the three classes of Maxwell Motor stock of record Monday are offered the privilege of subscribing to first preferred stock of the company at par, to the extent of 5 per cent of their holdings. This step is taken in order to comply with legal requirements.

Under the plan recently announced for the funding of the accumulated 14½ per cent back dividends on the first preferred stock, warrants will be issued to the extent of the 14½ per cent, and will be convertible into first preferred stock at par. The amount of first preferred

stock required for the future conversion of dividend warrants is \$1,749,804, of which \$720,667, represented by first preferred stock trust certificates now in the treasury, is already available, leaving a balance of \$1,029,136 to be provided through the increase in the present amount of first preferred.

U. S. L. Gets Working Cash Capital of \$500,000

NEW YORK CITY, Nov. 13—The United States Light & Heating Corp., through the purchase of 50,000 shares of its treasury stock by Slattery & Co., local brokers, gets a working cash capital fund of about \$500,000. This amount includes previous amounts released and surplus cash turned over by the stockholders' protective committee. The company also has a substantial amount of common and preferred stock, still in the treasury. Beyond cash on hand, the other working assets of inventories and accounts receivable total several hundred thousand dollars. There are no liabilities beyond current trade accounts, all of which are now discounted in cash, saving thereby an amount in excess of the interest on the \$500,000 bonds outstanding.

Market Prices Advance

NEW YORK CITY, Nov. 16—Market prices in general were higher last week. Crude rubber, metals, and oil prices saw large advances. The reported closing of the Suez Canal was reflected in the rising in prices. Crude rubber, both here and in London, went up. Fine Up-River Para closed on Monday at 64 cents, 5 cents higher than the opening the previous Tuesday. It was contended by some that the effect upon the trade was not likely to be serious, as it would result merely in a delay of a few weeks in arrivals of rubber from the Far East. The tin market, as a result of the report, was severely upset. Spot tin advanced \$7.75 a ton, closing at \$44.00 on Monday.

Oil prices in Kansas reached the \$1 mark yesterday, when the price was advanced from 90 cents a barrel. Pennsylvania crude is now \$1.90 a barrel.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.56	.56	.56	.56	.56	.56	...
Antimony	.35	.35	.35	.35	.35	.35	...
Beams and Channels, 100 lb.	1.77	1.77	1.77	1.77	1.77	1.77	...
Bessemer Steel, ton.	23.50	23.50	23.50	23.50	23.50	23.50	...
Copper, Elec., lb.	.18½	.18½	.18½	.18½	.18½	.18½	+.00½
Copper, Lake, lb.	.18½	.18½	.18½	.18½	.18½	.18½	+.00½
Cottonseed Oil, bbl.	7.50	7.65	7.82	7.80	7.85	7.85	+.35
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.46	.46	.46	.46	.46	.47	+.01
Gasoline, Auto, bbl.	.18	.18	.18	.18	.18	.18	...
Lard Oil, prime.	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.00	5.15	5.15	5.15	5.25	5.25	+.25
Linseed Oil	.62	.64	.64	.64	.64	.64	+.02
Open-Hearth Steel, ton.	27.00	27.00	27.00	27.00	27.00	27.00	...
Petroleum, bbl., Kansas, crude	.80	.80	.80	.80	.90	1.00	+.20
Petroleum, Pennsylvania, crude	1.95	1.85	1.85	1.85	1.85	1.90	-.05
Rapeseed Oil, refined	.77	.79	.77	.77	.85	.89	+.12
Rubber, Fine Up-River, Para	.59	.59	.61	.63½	.64	.64	+.05
Silk, raw, Italian	4.40	4.45	4.45	4.45	4.55	4.80	+.40
Silk, raw, Japan	4.25	4.47½	4.47½	4.47½	4.55	4.80	+.30
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	36.25	37.00	38.50	43.00	45.00	44.00	+7.75
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.04½	...

Gasoline prices throughout the country went up again last week. The rise in prices was the strongest demonstration the market has yet given of improvement in oil conditions which set in during August last.

Copper advanced yesterday to 18½ cents a pound. This metal is growing scarce, and since prompt deliveries are being demanded, the result has been an advance in the quotations.

Lead advanced to \$5.25 per 100 lb. yesterday. The demand for lead has been very active, and consumers were reported to be running very low on stocks.

McNaull Tire Co. Increases Capital \$2,225,000

TOLEDO, OHIO, Nov. 11—The McNaull Tire Co. has been incorporated with a capital of \$2,500,000. The new company is to succeed the McNaull Auto Tire Co., which operates a manufacturing plant on the East Side.

The present capitalization of the McNaull Auto Tire Co. is \$275,000. Under the reorganization the capital of \$2,500,000 will be divided into \$1,000,000 preferred and \$1,500,000 common stock.

The plant will be enlarged by the reorganized company and employment given to 1000 more men.

W. D. McNaull was elected president; M. W. McNaull, vice-president, and A. B. Laskey, secretary, at a meeting of the McNaull Tire Co., held Nov. 12.

As the McNaull Tire Co. succeeds the McNaull Auto Tire Co., the directors of the old company will serve as a provisional board, representing Eastern men who have agreed to finance the new concern. W. D. McNaull was president of the old concern.

Overland to Redeem Preferred

NEW YORK CITY, Nov. 12—The Willys-Overland Co. has given notice that it has decided to redeem the whole of its preferred stock at 110 per cent of par, plus accrued dividends. Each holder is requested to present his certificate of stock at the office of William Salomen & Co., 25 Broad Street, this city, on Jan. 13 next, when he will receive payment. After that date dividends will cease on the stock.

Bourne Truck to Use Master

DETROIT, MICH., Nov. 13—The Master Carburetor Corp. announces that the Atlantic Refining Co., Philadelphia, Pa., which is a subsidiary organization of the Standard Oil Co., has contracted to use Master carburetors as standard equipment on the Bourne truck, which the company is bringing out.

26,239 Freight Cars Idle

NEW YORK CITY, Nov. 13—Figures compiled by the American Railway Assn. show that on Nov. 1 the railroads

THE AUTOMOBILE

Security Prices

Irregular

Kelly-Springfield Tire and Paige-Detroit Feature Market with Large Gains

NEW YORK CITY, Nov. 17—Security quotations, though irregular, have picked up in value since their break last week. General Motors rose 23 points; Willys-Overland, 9 points; Maxwell, 10½ points; Kelly-Springfield common, 219 points; and Paige, 85 points. General Motors on Thursday reached 400, showing pronounced strength. At the top the stock was 318 points above the low of the year, 82, made on Jan. 2. The stock dropped yesterday to 393 after the story had reached Wall Street that the company had declared no dividend. At the closing yesterday, Overland common quoted at 233.

In the tire issues, Firestone with its 50-point drop, and Kelly-Springfield with its 219-point rise, featured the market.

Peerless common dropped 105½ points, after a 25-point rise last week. Reo rose 9 points, Stewart-Warner common rose 7 points and Maxwell first and second preferred each rose 4 points.

The Detroit quotations, with the exception of 120-point rise on Paige stock, was normal. General Motors common rose 12 points. Continental Motor common dropped 10 points.

\$100,000 Accessory Firm Formed

FORT WAYNE, IND., Nov. 13—Articles of incorporation have been filed with the

Secretary of State for a company composed mainly of Fort Wayne men, who will manufacture accessories for automobiles. The capital stock is placed at \$100,000. The firm will have its offices in the Schoaff Building, Fort Wayne. The directors are: T. O. Nelson, William N. Ballou, E. G. Reed, Fort Wayne; W. H. Lillich and H. G. Miller, St. Louis. The concern will manufacture a non-skid apparatus consisting of a pair of shoes operated by compressed air, obtained from the exhaust. The shoes are released by pressing a button and drop to the ground, instantly stopping the car. As they lift the car from the ground the device may be used while tires are being changed.

Hundson Metal Products Co. Formed with \$1,000,000 Capital

DOVER, DEL., Nov. 12—The Hundson Metal Products Co., to engage in the manufacture and sale of metal castings, metal forgings and shapes and to do a general machinery business, was incorporated here with a capital of \$1,000,000. The incorporators are: A. N. Seaman, D. M. Clark of New York City, and H. W. Davis of Wilmington, Del.

Toledo-Ford Tire Co. Now Toledo-Findlay Tire Co.

FINDLAY, OHIO, Nov. 15—The Toledo-Ford Tire Co. stockholders met at their general offices here to-day and changed the name of the corporation to the Toledo-Findlay Tire Co., upon the advice of a legal representative of Henry Ford, who claimed the company was infringing upon his rights.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914		1915		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
Ajax-Grieb Rubber Co. com.			300	..	
Ajax-Grieb Rubber Co. pfd.	101	..	..	..
Aluminum Castings pfd.			88	89	+2
J. I. Case pfd.			150	160	-6
Chalmers Motor Co. com.			102	105	..
Chalmers Motor Co. pfd.			123	127	..
Chevrolet Motor Co.			68	68½	-2
Electric Storage Battery Co.			720	72	-50
Firestone Tire & Rubber Co. com.			112	..	
Firestone Tire & Rubber Co. pfd.			392	396	+23
General Motors Co. com.			112½	113½	+½
General Motors Co. pfd.			73	75	+2
B. F. Goodrich Co. com.			111	111½	..
B. F. Goodrich Co. pfd.			328	335	..
Goodyear Tire & Rubber Co. com.			110	112	..
Goodyear Tire & Rubber Co. pfd.			..	..
Gray & Davis, Inc. pfd.			38	40	+3
International Motor Co. com.			64	68	..
International Motor Co. pfd.			295	305	+219
Kelly-Springfield Tire Co. com.			93	96	-1
Kelly-Springfield Tire Co. 1st pfd.			75	76	-1
Kelly-Springfield Tire Co. 2d pfd.			78	82	+10½
Maxwell Motor Company, com.			101	103	+4
Maxwell Motor Company, 1st pfd.			61	62	+4
Maxwell Motor Company, 2nd pfd.			249	252	..
Miller Rubber Co. com.			109½	110½	..
Miller Rubber Co. pfd.			..	..
New Departure Mfg. Co. com.			131	135	+1
New Departure Mfg. Co. pfd.			100	102	..
Packard Motor Car Co. com.			550	..	+85
Packard Motor Car Co. pfd.			41½	42½	-105½
Paige-Detroit Motor Car			92	96	..
Peerless Motor Car Co. com.			80	85	..
Peerless Motor Car Co. pfd.			98	100	..
Portage Rubber Co. com.			17	..	+2
Portage Rubber Co. pfd.			..	24½	+9
Regal Motor Co. pfd.			49	51	+9
*Reo Motor Truck Co.					
*Reo Motor Car Co.					

No quotations available at this time on account of war.

	1914		1915		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
Splitdorf Electric Co. pfd.			82	84	+7
Stewart-Warner Speed. Corp. com.			106	..	
Stewart-Warner Speed. Corp. pfd.			162	164	..
Studebaker Corporation com.			111	113	-2
Studebaker Corporation pfd.			89	91	-1
Swinehart Tire & Rubber Co.			170	172	+1
Texas Company			54	56	+1
U. S. Rubber Co. com.			106	108	+2
U. S. Rubber Co. 1st pfd.			215	220	..
Vacuum Oil Co.			110	..	
White Company pfd.			247	249	+9
Willys-Overland Co. com.			111	112½	+2
Willys-Overland Co. pfd.					
OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE					
ACTIVE STOCKS					
Chalmers Motor Co. com.			97	162	-3
Chalmers Motor Co. pfd.			93½	101	-1
Continental Motor Co. com.			155	230	-10
Continental Motor Co. pfd.			75	89	94
General Motors Co. com.			61	389	395
General Motors Co. pfd.			82	112½	114½
Maxwell Motor Co. com.			13½	15	+2
Maxwell Motor Co., 1st pfd.			43	47	103
Maxwell Motor Co. 2d pfd.			18	20	+2
Packard Motor Car Co. com.			100	131	135
Packard Motor Car Co. pfd.			89	100	+1
Paige-Detroit Motor Car Co.			..	600	700
*Reo Motor Car Co.			21½	22½	52½
*Reo Motor Truck Co.			10½	11½	21½
Studebaker Corp. com.			..	158	161
Studebaker Corp. pfd.			..	110	115
INACTIVE STOCKS					
*Atlas Drop Forge Co.			25	29	..
Ford Motor Co. of Canada			500	2,000	2,750
Kelsey Wheel Co.			185	215	..
*W. K. Prudden Co.			18½	20½	25½
Regal Motor Car Co. pfd.			25	18	..

*Par value \$10.

Test Massachusetts Law

Automobile Legal Association Seeks to Prove License Fee Often Double Tax

BOSTON, MASS., Nov. 13—The first move in a plan to test the constitutionality of the Massachusetts motor law was started here this week. William L. Thibodeau, general counsel for the Automobile Legal Association, took a car that was unregistered and drove it on the streets until he was arrested. In the lower court he was found guilty and appealed. The case now goes to the Superior Court, and it is believed it will find the law is all right there, which will allow another appeal to the Supreme Court. The basis of the case will be fought on the plea that motorists now paying a personal property tax are being unjustly taxed in the guise of registration fees. It is the result of the plan to increase the fees on cars and trucks in the next legislature. The Automobile Legal Association has about 9000 members and is a powerful body, with plenty of financial backing, and not identified with any other organization. It is probable that the various automobile organizations of the State will line up on one side or other of the fight.

New Iowa 3-Year-License Law in Force Jan. 1

DUBUQUE, IOWA, Nov. 13—The new automobile registration law in the State of Iowa will go into effect Jan. 1, 1916. The new law provides for number plates which will last three years. An owner paying the license fee for 1916 will receive number plates for the three years.

In 1917 and 1918 notice will be sent from the State to the owners to pay the registration fees for those years.

The fees for registration have not been changed. Machines used four years prior to Aug. 1 will be registered for one-half of the regular fee. Machines purchased after Aug. 1 will be registered that year for one-half the fee.

Under the new law all fees are due Jan. 1. A penalty of 10 per cent will be added if not paid by April 1 and 5 per cent additional for each month thereafter.

Motor vehicles are subject to lien for all unpaid fees.

10 Days in Canada Free

OTTAWA, ONT., Nov. 13—The Customs Department at Ottawa has just granted to United States motorists entering Canada for touring purposes a privilege hitherto denied them, although Canadian motorists have enjoyed the privilege in the United States. Now a non-resident

owner of an automobile manufactured abroad desiring to bring his machine into Canada for a stay of not more than ten days may be granted a free permit at the discretion of the customs collector at the port of entry, provided that the latter is satisfied of the good faith of the motorist. Hitherto American motorists have had to make a formal entry and file a bond costing about \$5.

Boyce Motometer Injunction Against Stewart-Warner Made Permanent

NEW YORK CITY, Nov. 12—The temporary injunction granted May 16, 1914, by the district court here to Harrison H. Boyce and the Motometer Co., Inc., against the Stewart-Warner Speedometer Corp., and which was affirmed by the circuit court of appeals last December, has been made permanent. The injunction prohibits the Stewart-Warner corporation from infringing the Boyce Motometer patent by the manufacture and sale of a radiator cap thermometer adjudged by the court to be an infringement of the Motometer.

The suit was brought by Harrison H. Boyce and the Motometer Co., Inc., against the Stewart-Warner Speedometer Corp. April 11, 1914, in the United States district court for the southern district of New York. Stewart-Warner answered May 1, claiming that the Motometer patent was void for lack of invention. The court, however, upheld the validity of the patent and issued the temporary injunction, which has now been made permanent, after having been affirmed by the circuit court of appeals last December. The Stewart-Warner corporation stopped the manufacture of the infringing device as soon as the temporary injunction was issued.

Rumely Plant Sale Dec. 9

SOUTH BEND, IND., Nov. 15—Official notice of the sale of the plants, including real estate, improvements, machinery, patents, trademarks, records, personal property, etc., of the M. Rumely Co., LaPorte, gives Dec. 9 at noon, in the main offices of the Rumely company in LaPorte, as the time and place, with Receiver F. P. Mount as special master. So far as known the Advance-Rumely Co. will be the only bidder for the property. This is the name of the reorganized company.

New Plant for Bukholt

STEVENS POINT, WIS., Nov. 13—The Bukholt Mfg. Co., Stevens Point, Wis., manufacturing a line of tire and automobile accessories, has broken ground for a new three-story factory, to be 74 by 100 ft. The building will be ready about Feb. 1. In the meantime overtime operations are the rule in the present plant.

A. A. A. Board Fines Oldfield

For Demonstration Performance at Outlaw Race Meet —To Revise Rules

NEW YORK CITY, Nov. 11—At the regular meeting of the Contest Board of the American Automobile Association, held at headquarters here to-day, Barney Oldfield, veteran driver, was fined \$250, for driving a demonstration performance in his car on a track at Wichita, Kan., where an outlaw racing meet was being held. Oldfield was advertised as a co-attraction with outlaw drivers, but did not drive in competition. His performance was made in company with an aviation performance by aviator Thompson. This is the second time where the fine penalty has been imposed on drivers and companies for infraction of rules during the last year, and it seems a relatively just punishment.

The board took up the work of revising the contest rules for 1916 which work will be completed before the first of the year.

The board has been requested to issue sanction covering meets in the Philippine Islands, which will be done.

Several drivers who have violated the rules during the past year were reinstated and others denied application for reinstatement. Among those reinstated are: D. K. Sworder, G. C. Bergdoll, Herbert M. Strachan, A. A. Mattison and B. Ward Bean. Applications for reinstatement were denied Arthur Klein and William B. Brown. The following drivers were disqualified for different periods: C. E. Wood, two years, Henry Skutt, A. Ingram, and M. J. Crell, until January, 1917. James B. Ryall and John A. Maiss were disqualified for one year. Frank Topping, a registered mechanic who has violated the rules during the present year, was placed on the ineligible list.

Cooper to Try for Non-Motor-Stop Record in Maxwell

LOS ANGELES, CAL., Nov. 16—Earl Cooper, driving a 1916 stock Maxwell, is going to try for a non-motor-stop long distance mileage run in and around this city during the present month. The stock status of the car is being established, a sanction has been obtained from the American Automobile Association, and official inspectors and technical committee will be employed.

Killen-Strait Gets War Order

APPLETON, WIS., Nov. 13—The Killen-Strait Mfg. Co., Appleton, Wis., builder of the Strait tractor, a 50 hp. gasoline or

kerosene machine, has booked an order for tractors which will not only tax its capacity for more than twelve months but oblige the company to contract for a large supply from outside manufacturers. The tractors will be sent to European governments for use in military operations. William Strait, designer, has just returned from Europe after a 4 months' stay, during which he demonstrated four models of the tractor on the field. The order calls for thirty to thirty-five tractors a week.

Three More Car Exhibitors

NEW YORK CITY, Nov. 15—The newest additions to the list of show exhibitors are the Barley Mfg. Co., which is to exhibit the Halladay car at the Chicago show, and the S. G. V. car, which is listed to exhibit at the New York show. Application for space has been received from J. B. Ferguson, Ltd., of Belfast, Ireland, and this firm will exhibit a chassis of the Fergus car in all probability. The Fergus is of 14-20 hp., is equipped with a four-cylinder motor and has many mechanical features which will command attention.

Milwaukee Show Jan. 7-13

MILWAUKEE, WIS., Nov. 13—The Milwaukee Automobile Dealers, Inc., has selected the week of Jan. 7 to 13, inclusive, as the date for holding the annual Milwaukee show in the Auditorium. As for two years past, the show will be opened on Friday evening and close on the following Thursday night. Bart J. Ruddle, assistant secretary of the M. A. D., will again be show manager.

Franklin Off on Oil Test

NEW YORK CITY, Nov. 17—A Franklin six left the headquarters of the Automobile Club of America to-day en route for Chicago. The car is accompanied by two A. C. A. observers who will note the consumption of gasoline and oil along the route. The first stop will probably be in Philadelphia. An effort is to be made to make the entire distance on 1 gal. or less of lubricating oil.

Accessory Department at Baltimore Show

BALTIMORE, MD., Nov. 13—Owing to the numerous demands by the dealers in accessories and supplies the committee in charge of the show that will be held in Baltimore Jan. 18 to 22 have decided to set aside a big room in the Fifth Regiment Armory, where the show will be held, for the showing of accessories. Applications for all space for cars, both passenger and commercial, as well as for the accessory division, must be made before Dec. 10, and drawings for the space as to location will be made on Dec. 20.

THE AUTOMOBILE

80 Exhibitors at Providence

144 Passenger Cars and 32 Trucks on Display—First Night Attendance 10,000

PROVIDENCE, R. I., Nov. 12—The annual show of the Rhode Island Automobile Dealers' Association, and the first automobile exhibition of the season in the East, opened here this evening with eighty exhibitors showing forty-five passenger and seventeen commercial makes. It will continue through until Nov. 20. The show is being held in the State Armory. The passenger cars, numbering 144, are on the main floor, with the thirty-two commercial vehicles in the basement with the accessories. The attendance at the opening this evening was large, running well above 10,000.

Fifth Avenue Buses Earn \$1,451,508.10 in Year

NEW YORK CITY, Nov. 16—The Fifth Avenue Coach Co., this city, during its fiscal year, ending June 30 last, carried 14,050,471 passengers at 10 cents each, in its 133 buses, its revenue from this source amounting to \$1,405,047.10, or 34.52 cents per active bus mile. The total mileage of the buses, including 43,929 idle miles, was 4,113,625. Its revenue from the livery service, amounting to 19,374 bus miles, was \$15,086, and the advertising in its buses amounted to \$31,375, thus bringing the total revenue from operation up to \$1,451,508.10, just \$274,857.72 more than the previous year.

A feature brought out in the report of the company is that the 133 buses ran at a cost of only 1.504 cents per bus mile, each bus using six tires, the rear wheels each having two tires. Last year the cost was 1.7 cents; the previous year, 2 cents; and the year before that, 3.13 cents. This greater tire mileage is attributed to a better grade of rubber; better supervision; better drivers; better brake mechanism; and the use of steel wheels instead of wood. The company paid out in tire maintenance during the year, \$61,941.10.

Studebaker to Build Branches in Portland and Dallas

DETROIT, MICH., Nov. 12—Officials of the Studebaker Corp. are now in Portland, Ore., and also in Dallas, Tex., where it has been decided to erect Studebaker branches. The plans for the new buildings are not yet finally approved, but it is said that they will be from four to six stories high and will have at least 50,000 sq. ft. of floorspace.

The new branch house in Kansas City,

Mo., is nearing completion and will probably be occupied by Jan. 1. Fronting on Grand Avenue, the structure will be five stories high, while on the Twenty-first Street side it will have six stories. On the first floor there will be the show rooms and offices for both the retail and wholesale branches. Repair parts and stock will be kept on the second floor, and on the other floors cars will be stored. The basement will be used partly as repair shop and partly as shipping and receiving room.

Overland Stores Co. Buys Bowman & Libby, Inc.

MINNEAPOLIS, MINN., Nov. 13—The Overland Stores Co. has bought the business of Bowman & Libby, Inc., distributor of Overland and Willys-Knight cars at 1203 Hennepin Avenue, and will conduct a factory branch there. The Minneapolis company controlled a large Minnesota territory, as well as contiguous territory in Wisconsin, Iowa and South Dakota. F. N. Coats, formerly of the Toledo office, is now manager and will live in Minneapolis and divide his time between the main office and the new wholesale house in the Midway.

Cars will be placed in the new warehouse of the company this month. Operation will start by Jan. 1, or sooner. The plant will be for wholesale storage, sales, service and repairs. Duplicate parts will be carried also. The building covers about 10 acres and has railway connection with all steam lines entering Minneapolis and St. Paul. The floorspace is 432,450 sq. ft., the building being 186 by 465 ft. and five stories.

Northwest Hupmobile Co. Formed

MINNEAPOLIS, MINN., Nov. 12—The Northwest Hupmobile Co. has been organized here, with S. D. Briggs, formerly with the Pence Co., as manager. The new company will handle the wholesale distributing of the Hupmobile for North Dakota, the eastern part of Montana, Minnesota and the western part of Wisconsin.

Firestone Day in Des Moines

DES MOINES, IOWA, Nov. 13—H. S. Firestone, head of the Firestone Tire & Rubber Co. of Akron, Ohio, was the central figure of a gathering of over 200 Iowa dealers in Des Moines on Nov. 10 for the celebration of Firestone Day. R. J. Firestone, general sales manager of the company, also was in attendance. An entire day of festivities was followed by an evening banquet addressed by the Messrs. Firestone and by Lafe Young, Sr., former United States Senator, and publisher of the *Des Moines Capital*; Harvey Ingham, editor of the *Des Moines Register*; Henry Wallace, editor of *Wallace's Farmer*, and others.

U. S. Army Wants More Trucks

Dept. Commanders and Quartermasters Recommend Increase of Motor Service

WASHINGTON, D. C., Nov. 13—Recommendations made this year by department commanders and quartermasters indicate that there is a growing desire to obtain additional motor trucks as a means of transportation for military supplies at army posts and in the field.

The quartermaster of the Hawaiian department has made a special report on transportation in the Hawaiian Islands and he has recommended that motor-truck transportation be substituted, in part, for mule and escort-wagon transportation, and that one 6-ton truck for general hauling and one 3½-ton truck with dump body for coal be supplied to the quartermaster depot at Honolulu, in addition to the three 1½-ton trucks now on hand there.

The army medical department also is negotiating for purchase of additional motor ambulances, and a board shortly will make a report concerning the type best adapted for use in connection with field hospitals.

Must Give Factory Numbers When Registering Cars in Ohio

COLUMBUS, OHIO, Nov. 13—To make identification easier, State Registrar of Automobiles W. H. Walker will require all applicants for licenses to give the serial factory numbers of their machines when they apply after the first of the year. With this information on file the department will be better enabled to trace the owners of stolen cars.

Each application for a license now in addition to giving the full name and address of the applicant, must give the name, make, motive power, style and horsepower of the machine.

Registrar Walker intends to establish a number of branch offices next year from which licenses will be issued just the same as from the main office in Columbus.

Reorganize Wisconsin Automobile Business Association

MILWAUKEE, WIS., Nov. 16—Milwaukee garagemen, supply makers and dealers and others interested in the automobile business have undertaken to reorganize the Wisconsin Automobile Business Assn., which was organized about a year and a half ago but after brief activity went to sleep. A meeting was held Nov. 11 on call from the officers, and plans laid for a reconstruction of the

association on broad lines. The officers are: President, W. J. Schubert, Milwaukee Auto Specialty Co.; vice-president, F. A. Olsen, Curtis Automobile Co.; secretary, Roland Moeller, Auto Service & Supply Co.; treasurer, Oscar F. Fischedick, Auto Supply Co., all of Milwaukee. The association has a membership of 255 and under the new plan will increase this to at least 1000.

The business has been divided into ten distinct sections, each of which will be organized separately but be a part of the association. The first work will be to weld together the garagemen and repairshop keepers. Fred C. Carter, of the Auto Livery Co., was named chairman of this division, and H. E. Wilson, secretary. Meetings will be held in four quarters of the city so that all men in this line of business can be reached directly and intimately. Other divisions to be organized are: Car dealers and salesmen; tire dealers; painting and trimming shops; electrical repairmen; publishers to the motoring industry; gasoline and oil dealers; accessory and supply makers; jobbers and dealers in accessories and supplies, etc.

Delco Repairs, Gratis, Equipment Damaged in Texas Storm

DAYTON, OHIO, Nov. 12—The Dayton Eng. Lab. Co., this city, has to date repaired, without charge, fifty-four cars on which the Delco electric systems had been damaged by the storm and flood in the neighborhood of Galveston, Tex. Of these five were Cadillacs, sixteen Buicks, seven Oaklands, ten Hudsons, seven Coles, three Cartercars, five Oldsmobiles and a Moon. The company is in receipt of a number of letters of appreciation of this service from Galveston, Beaumont and Port Arthur, Tex.

Vogler in New York for Maxwell—Garth Succeeds Him in Philadelphia

PHILADELPHIA, PA., Nov. 15—J. R. Garth has succeeded H. J. Vogler as district representative in this territory for the Maxwell Motor Co., Mr. Vogler having been appointed metropolitan district representative in New York for the same company.

F. Shirley Boyd Dead

BOSTON, MASS., Nov. 13—F. Shirley Boyd, one of the pioneers in the accessory trade in Boston who began with the old bicycle regime, died last Friday following an operation for appendicitis. He had built up one of the largest accessory businesses in New England, handling many well-known accessories.

Olds Branch Heads Meet

LANSING, MICH., Nov. 11—The annual fall meeting of the heads of branches of the Olds Motor Works, also the district traveling men and the salesmen who act

as district representatives has just been held. The men were here five days and went over all the details of the plans of the 1916 season. A talk was given by W. H. Mooney, installation engineer of the Dayton Engineering Laboratories which makes the Delco starting and lighting system. Another of the talks was by William Farr, who spoke about the Johnson carburetor. This carburetor and electric system are part of the Oldsmobile equipment.

George Robertson Joins Dunlap Tire Distributor

NEW YORK CITY, Nov. 13.—George H. Robertson, prominent in the automobile racing field, and recently president of the Auto Supply Co., this city, and later eastern district manager of the Houk Mfg. Co., Buffalo, N. Y., has joined Otto Braunschwarth, this city, as vice-president. This company is the American distributor of the Canadian Dunlap tire.

M. A. M. Adds List Dept.

NEW YORK CITY, Nov. 12—The Motor and Accessory Manufacturers which counts 238 manufacturers of automobile accessories in its membership roster, has recently added to its activities by adding a new department which is prepared to do addressing work for all of its members. The association has compiled in stencil form a list of over 2,000,000 automobile owners and has classified these according to make of car so that any accessory maker can readily address all of these owners in any city, State, or part of the country. The working of this department, which has been under way for a couple of months, is that any member of the accessory organization can forward his envelopes, have them addressed, and returned to his business office. The list is only open to accessory makers who are members of the association.

To properly carry on this work the Motor and Accessory Manufacturers have secured space at 225 West Fifty-seventh Street, where this work is carried on, and where they have a force of 100 men and girls engaged in compiling their lists, making stencils and doing the addressing work.

Neuman to Distribute Chalmers

MILWAUKEE, WIS., Nov. 15—Harry Newman, Inc., Chicago, Ill., has been appointed distributor for Chalmers cars in the State of Wisconsin, southern Minnesota and northern Michigan, supplanting the Hoppe-Hatter Motor Co., Milwaukee, Wis. The Newman company has leased the former Packard garage at Grand Avenue and Seventh Street, as headquarters and service station. Branch service stations and salesrooms are to be established in every city of consequence in the territory.

Factory Miscellany

Tire Fabric Co. Adds—The Killingly Mfg. Co., Killingly, Conn., maker of automobile tire fabrics, will construct a weave shed in that city.

To Make Tops in Vincennes—J. D. Browdues, Martinsville, Ind., will establish a factory at Vincennes, Ind., for making automobile tops and bodies.

Arrow Co.'s Plant Started—The Arrow Manufacturing Co., has broken ground for a new factory located at Broadway and Emerald Avenue, Toledo, Ohio, to be 60 by 120 ft., three stories high and to cost \$20,000. The concern makes electrical apparatus of all kinds.

McClurg Finishes First Tires—The McClurg Rubber Co., Coshocton, Ohio, has completed its first tire. The first actual work of turning out tires in the new plant started last week. Four or five extra men began work recently making a total of about thirty men now employed there.

Hartford Co. to Make Bearings—The Rockwell-Drake Corp., Hartford, Conn., has been incorporated with a capital of \$100,000 to make bearings, automobile parts, machines, etc. The incorporators are H. M. Rockwell, L. A. Drake and R. J. Brault of Bristol and R. B. Bennett of Hartford.

To Make Tires in Buffalo—The George

Miller Spring Tire Co., Buffalo, N. Y., has been incorporated with a capital of \$100,000 and will establish a plant for the manufacture of tires, springs, etc., for automobiles and other vehicles. G. and O. Miller and W. L. Williams, are the incorporators.

To Make Automobile Wheels—The Mutual Wheel Co., Moline, Ill., which has previously limited its output to wheels for wagons, buggies and farm machinery, has embarked in the manufacture of wooden wheels for automobiles. A special building has been erected to carry machinery for the new department.

To Make Towing Truck—The Projecta Co. has been organized at East Milton, Mass., to manufacture the Projecta towing truck. It is designed to meet the demands of owners whose vehicles have been disabled at front or rear and allows the part to be rigidly jacked up and towed for long distances at good speed.

Crow to Increase Production—The Crow Motor Car Co., Elkhart, Ind., has received orders for 200 cars to be furnished to its Kansas City distributing agency, the Velie Motor Co., during the next 90 days, and the Kansas City firm has contracted for 600 cars to be placed in Kansas and Oklahoma during the 1916

season. The Crow company is planning to increase its winter production to 200 cars a month and its spring production to 300 cars a month.

1238 Hupmobiles in October—Sales Manager Lee Anderson, of the Hupp Motor Car Co. Detroit, Mich., states that during October the company shipped 1238 cars, this being the biggest October business in the company's history. The number of inclosed cars shipped was 300 per cent better than last year. The demand for the winter car is general throughout the country, and is such that the original production schedule as to this line of cars had to be changed to increase the output of limousines, sedans and year-round touring types of cars.

To Make Wheels—The Ideal Wheel Co., Massillon, Ohio, has been formed in this city for the purpose of manufacturing wheels for automobiles, motorcycles and aeroplanes. No directors or officers have been elected yet. It is reported that the Ideal wheel will be constructed of steel, that steel springs will be used as spokes, and tires will be of the airless cushion type. The company will start business by making automobile wheels and will employ about twenty-five men. Arno Merkel of Cincinnati, one of the owners of the patent on this wheel, will be general manager of the concern.

The Automobile Calendar

Nov. 12-20.....	Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.	Jan. 8-15.....	Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.	Feb. 14-19.....	Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Nov. 20.....	Arizona 150-mile Grand Prix.	Jan. 15-22.....	Detroit, Mich., Show, Detroit Automobile Dealers' Assn.	Feb. 19.....	Newark, N. J., Show.
Nov. 22-27.....	Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.	Jan. 17-22.....	Rochester, N. Y., Show, Exposition Park, C. A. Simons, Mgr.	Feb. 20-27.....	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Nov. 28.....	Phoenix, Ariz., Grand Prix Race, State Fair Course.	Jan. 17-22.....	Wilmington, Del., Show, Wilmington Automobile Show Assn.	Feb. 21-26.....	Louisville, Ky., Show, First Regiment Armory.
Nov. 29-Dec. 4....	Electric Prosperity Week.	Jan. 18-22.....	Baltimore, Md., Show, Fifth Regiment Armory.	Feb. 21-26.....	Omaha, Neb., Show, Omaha Automobile Show Assn.
Dec. 5.....	Worcester, Mass., American Road Builders' Assn. Day.	Jan. 18-22.....	Lancaster, Pa., Show, Conestoga Park Pavilion.	Feb. 21-26.....	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Dec. 6-11.....	Springfield, Mass., Show, Auditorium.	Jan. 22-29.....	Montreal, Que., Show, Automobile Trade Assn. Ltd.	Feb. 29-Mar. 4....	Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
Dec. 7-10.....	New York City, American Society of Mechanical Engineers Convention.	Jan. 22-29.....	Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.	March 4-11.....	Boston, Mass., Car and Truck Show, Mechanics Bldg.
Dec. 31-Jan. 8....	New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.	Jan. 23-30.....	Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.	Mar. 28-Apr. 3....	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
1916	Importers' Salon, Hotel Astor.	Jan. 24-29.....	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.	May 13.....	New York City, Sheepshead Bay Speedway Race.
Jan. 3-9.....	New York City, S. A. E. Winter Session. Standards Committee Meeting.	Jan. 29-Feb. 5....	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.	May 30.....	Indianapolis Track Race.
Jan. 5-6.....	New York City, Convention National Assn. of Automobile Accessory Jobbers.	Jan. 29-Feb. 5....	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.	June 17.....	Chicago Track Race.
Jan. 7, 8, 10, 11...	New York City, Convention National Assn. of Automobile Accessory Jobbers.	Feb. 7-12.....	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.	June 28.....	Des Moines, Ia., Track Race.
Jan. 7-13.....	Milwaukee, Wis., Show, Auditorium.	Feb. 9-12.....	Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.	July 4.....	Minneapolis Track Race.
Jan. 8-15.....	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.			July 4.....	Sioux City Track Race.
				July 15.....	Omaha, Neb., Track Race.
				Aug. 5.....	Tacoma Track Race.
				Aug. 18-19.....	Elgin Road Race.
				Sept. 4.....	Des Moines Track Meet.
				Sept. 15.....	Indianapolis Track Race.
				Sept. 16.....	Providence Track Race.
				Sept. 30.....	New York City Sheepshead Bay Race.
				Oct. 7.....	Omaha Track Race.
				Oct. 14.....	Chicago Track Race.

The Week in the Industry



Holsworth Joins Fickling—Percy Holsworth, formerly of the Yellow Taxicab Co., has associated himself with the Fickling Enameling Corp., Long Island City.

Rosenwald Joins Detroiter Co.—The Detroiter Motor Car Co., Detroit, Mich., has appointed F. K. Rosenwald assistant in the sales department of the company.

Duggan Denver Briscoe Mgr.—G. A. Duggan is now manager of both the Estarado Garage, 1530 Clarkson Street, and the Briscoe Auto Sales Co., 1646 Broadway, Denver.

Ross Midgley Columbus Mgr.—C. E. Ross has been made manager of the Columbus, Ohio, branch of the Midgley Tire and Rubber Co., located at 224 North Fourth Street.

Kressler Leases Plant—The Kressler Auto Co., organized by G. P. Kressler, P. J. Blazer and Henry Ockchin, has leased the abandoned plant of the Fostoria Stave and Barrel Co., Fostoria, Ohio, which will be occupied after Dec. 1.

Gordon Leaves Boston White—H. M. Gordon, for the past nineteen years identified with the White Co.'s branch at Boston, Mass., with the position of purchasing agent, resigned last week to join the Boston branch of the Kelly-Springfield Tire Co.

Reeves Heads Brooklyn Chevrolet Sales—M. C. Reeves has been appointed sales manager of the Chevrolet Motor Co., Brooklyn, N. Y. Mr. Reeves was formerly connected with this branch as salesman and has been recalled from the factory field work to this present position.

Taylor with N. J. Car Spring Co.—L. H. Taylor, formerly salesman for the Denver branch of the B. F. Goodrich Co., is now Western manager for the New Jersey Car Spring & Rubber Co., in charge of Colorado, New Mexico, Utah, Wyoming and Montana, with headquarters at 238 Temple Court Bldg., Denver.

Wilkins Maxwell Supervisor—F. W. Wilkins, formerly manager of the Maxwell Motor Co.'s interests in Saskatchewan, has been made supervisor of the company's trade in Western Canada succeeding C. L. Acherson in that post. Mr. Acherson has been transferred to Windsor, Ont., and given charge of the distribution of Maxwell cars for the whole of Canada. The change came into effect this week. The Maxwell company has seventy-two dealers in the province of Saskatchewan.

Motor Men in New Roles

Gans Heads Indianapolis Studebaker—E. W. Gans has been appointed manager of the Indianapolis Studebaker district.

Lemon a Denver Mgr.—R. I. Lemon, recently manager of the Colorado Springs Auto Equipment Co., is now manager of the Denver Auto Goods Co., 1600 Broadway.

Bradford Mgr.—W. C. Bradford, recently manager of the Auto Livery Co., Denver, is now garage manager for the Denver Omnibus & Cab Co., 601 East Eighteenth Avenue.

Serfas Co. Opens Fourth Garage—The Serfas Motor Car Co., Lehighton, Pa., has opened its fourth garage in Pottsville, Pa. The others are located in Lehighton and Mauch Chunk.

Roberts Hupp Rep.—H. R. Roberts has been named as Northwestern representative for the Hupp Motor Co., with headquarters at Portland, Ore., and with territory covering Oregon, Washington, Idaho and Montana.

Huntoon in Portland—C. S. Huntoon of the White Co., will hereafter make his headquarters in Portland, Ore., yet covering the territory of Oregon, Washington, Idaho, Montana and British Columbia for the White Co.

Doan Heads Portland Saxon—W. B. Doan has been named distributor of Saxon cars throughout the State of Oregon and will head the Saxon Motor Sales Co. of Oregon, which will be located at 31 North Nineteenth Street, Portland.

Eubanks Heads Halladay Sales—P. J. Eubanks has assumed charge of the sales department and will hereafter look after all matters pertaining to advertising and distribution of the Halladay cars manufactured by the Barley Mfg. Co., Streator, Ill.

De Laite Velie Mgr.—H. R. De Laite, who has been identified with the Velie Motor Vehicle Co. for the past five years, has been appointed manager of the Hampden County agency which the company has opened at Springfield, Mass., with salesrooms at 379 Worthington Street.

Hurd and Cole F. W. D. Reps.—J. S. Hurd and F. A. Cole have joined the Four Wheel Drive Auto Co., Clintonville, Wis. Mr. Hurd was formerly associated with the Gramm-Bernstein Co., Lima, and will be a traveling representa-

tive. Mr. Cole will travel in the capacity of a representative of the company.

Joins Automobile Spring Force—C. M. White, Jr., who was formerly manager of the Detroit office of the Stromberg Motor Devices Co., and previous to that of the Detroit office of the Firestone Tire & Rubber Co., has become associated with the selling end of the spring department of the Detroit Steel Products Co.

White Springfield Overland Mgr.—M. T. White has been appointed manager of the new distributing station being erected for the Willys-Overland Co., Springfield, Mass. The new structure will be four stories of reinforced concrete with a 75-ft. frontage on Chestnut Street and 230 ft. depth on Winter Street. Mr. White has opened temporary salesrooms on Worthington Street.

Foster Resigns—J. W. Foster, manager of the Denver Auto Goods Co., 160 Broadway, Denver, and a member of that firm, has sold his interest and resigned as manager. He is well known to the trade in the Rocky Mountain district, being first vice-president of the Automobile Trades Assn. of Colorado and a vice-president of the Retail Credit Men's Assn. of Denver and the Associated Garages of America.

Harry S. Houpt to Make Changes—Harry S. Houpt, president of the Hudson Motor Car Co., New York City, has promoted De Witt Voorhis, assistant secretary and treasurer of the company and H. C. Huber, at present controller of the organization.

Mr. Voorhis will be made manager of the New Rochelle branch which on Jan. 1 will open a salesroom at Main Street and Centre Avenue. Mr. Huber will then become assistant secretary and treasurer of the company.

Curtiss and Ellis Make Change—H. R. Curtiss, for several years manager and treasurer of the Splitdorf Electric Co.'s New England branch at Boston, Mass., has been appointed manager and treasurer of the Excelsior General Supplies Co. at Chicago.

R. M. Ellis, for the past two years export manager of the Splitdorf Electrical Co., with headquarters at New York, has gone to Boston to assume charge of the company's branch there. He was formerly manager of the Bi-Motor Equipment Co. at Boston and is well known in that city.